

UOFA ENGINEER



the house that Reza built

Women in engineering

Take the pop quiz challenge

Leaders in engineering safety and risk management

Students enter the Beaver's Den

ALL ON THE SAME PAGE

Looking through the lineup of articles in this newly redesigned edition of *U of A Engineer*, it's heartening to see some of the Faculty of Engineering's highest priority initiatives reflected in the stories about our alumni and faculty members.



Innovation and entrepreneurship are characteristics we nurture in our students, and those traits are demonstrated by the outstanding achievements of alumni such as Govind Kaigala (Electrical '05, PhD '09), one of this year's U of A Alumni Horizon Award recipients (see story page 18). For the past several years, Michael Sikorsky (Computer '96) has been the faculty's first Entrepreneur-in-Residence, delivering valuable lessons to entrepreneurial engineering students through his Startup School and Beaver's Den projects (see page 32).

We as a faculty (and in fact, the entire university) have redoubled our focus on safety in the workplace and our Engineering Safety and Risk Management program, led by Gord Winkel (Mechanical '77, MSc '79), represents an innovative approach to making safety a priority at all levels (see our story on page 14). Another alumnus, Reza Nasserri (Electrical '70), has had a tremendous impact on safety in the residential construction industry through his drive to automate and industrialize construction processes. Find out how Reza and the faculty are working together to develop new approaches for the construction industry on page 20.

There are other reasons why construction has been front and centre: by the late spring of 2015, we will begin moving all of our engineering faculty and support staff into the new Innovation Centre for Engineering (ICE). This allows vacated space in other engineering buildings to be transformed into additional teaching, learning and research spaces. This expansion of space will enable the faculty to move ahead with a government-funded expansion of our Engineering Co-operative Education program from 1,600 students to approximately 2,400 students over the next few years. To accommodate this expansion, we will make increased use of summer academic terms and dramatically increase the number of co-op placements available to employers. You will undoubtedly see some of these young engineers in your workplaces; we know through over 30 years of experience with this program that your mentorship will make a difference in their lives and careers.

Growth in the faculty will continue in other areas as well. The additional space resulting from the construction of the ICE will provide capacity to increase our undergraduate student population from about 4,150 last year to 5,000 by the year 2017, with the ability to grow to about 6,000 in the ensuing years. Our graduate student body is growing as well (see our article about graduate student recruitment, on page 10). We anticipate an increase from the present number of 1,600 to 2,000 by 2018, and to 2,500 by the early 2020s. More undergraduate and graduate students also means more professors: we envision expanding from our current level of approximately 200 engineering professors to 300 by 2020.

This is an exciting period of growth and forward momentum across all areas. As I follow the achievements of our alumni, I am encouraged to see that we are heading in the same directions, and can't help but feel incredibly proud and thankful of the impact you have in so many areas.

David T. Lynch PhD, P.Eng
Dean of Engineering

Vision To be one of the largest and most accomplished engineering teaching and research centres, a leader in North America.

Mission To prepare top-quality engineering professionals, to conduct world-leading research and to celebrate the first-class reputation and outstanding accomplishments of alumni.

Values Dedication, integrity, professionalism and excellence in teaching, research and service to the global economy and community.

U of A Engineer is the Faculty of Engineering alumni magazine. It is published twice a year by the Dean's Office and is distributed to Faculty of Engineering alumni, friends, students and staff.

Dean of Engineering

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(PhD Chemical '82), PEng

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FSC LOGO

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SOLDIER ON

Norman Reid was shot out of the sky twice during the Second World War but has never stopped getting back up and helping others.



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WOMEN IN ENGINEERING

The Faculty of Engineering and its alumni are working hard to diversify engineering.



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WALKING THE WALK ON SAFETY

A new program is educating students about engineering safety and risk management.

ON THE COVER Reza Nassiri (Electrical '70) wants to see a revolution in the construction industry. His family's \$10-million gift starts things off in a very big way. Page 20. Photo by Demetri Giannitsios.

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COVER TO COVER A NEW LOOK FOR U OF A ENGINEER

We've got some big news but we're going to keep it brief. We've redesigned *U of A Engineer* magazine and organized its contents to help you find the stories and features you're interested in, to provide you with different styles of storytelling and to give you more chances and reasons to connect with us.

The new design deals with both looks and substance. This represents the first graphic design change that I can find since *U of A Engineer* began publishing, in the 1990s. The new design gives *U of A Engineer* a more contemporary look—one we feel is more in line with U of A Engineering alumni: professional, leading edge, and with plenty of personality.

Our table of contents reflects the division of our magazine into departments, giving it structure that had been lacking. You now have a map, on page 3, to navigate your way through different features and departments.

Notable new editorial features are Follow-up, in which we revisit and update stories we've published previously. If we felt something was important enough to put on the cover of the magazine, or to dedicate four or five pages to, why wouldn't we provide you with an update? It's a short, easy-to-read feature we think you'll enjoy.

We're certain you'll spend time on Pop Quiz, a new feature that invites you to revisit a midterm exam and test your engineering knowledge. The laws of physics haven't changed since you studied engineering here, so turn to page 9 and give it your best shot!

We're also encouraging you to send us more letters to the editor and updates on you and your fellow alumni for our Kudos section. This is your magazine—please contribute!

On that note—we're on pins and needles here wondering what you think of the magazine's new look and content. Please send me a note and share your thoughts and help us out with story ideas. Compliments are nice, but we're not fishing for those—send us your honest opinions. We want to be sure the *U of A Engineer* has a positive impact. Reach me at richard.cairney@ualberta.ca.



Richard Cairney
Richard Cairney
Editor

LETTERS



HVAC is a breath of fresh air

Editor:

I was delighted to see your article in the latest issue of *U of A Engineer* regarding the donation by Engineered Air to establish the Chair in HVAC Engineering along with the Fellow in HVAC Engineering (*Change is in the air / HVAC comeback, Spring 2014*). Despite their low profile, air conditioning and refrigeration have had an enormous impact on the lives of people around the world. We tend to think about the comfort that HVAC provides in

our buildings and homes. This is only the tip of the iceberg.

HVAC is what I would call an enabling technology. HVAC has enabled the expansion of industry and populations to flourish in many climates around the earth that would normally be inhospitable. We are able to enjoy fresh food at all times from every corner of the globe. The field of medicine has been advanced, allowing us to live longer, healthier lives. The list goes on—HVAC has improved production technologies in virtually every industry.

Like many people, I got into this industry by chance and not by design. HVAC was the furthest thing from my mind while in school. Yet I ended up spending over 40 years (and still counting) in this industry that has been so kind to me. Here's hoping that this donation will help create awareness and attract and inspire a

new generation of engineers to this important field.

Sincerely,

Roger Grochmal,
Electrical '72, MBA '73
CEO, AtlasCare Heating & Cooling
Oakville, Ont.

Family's history is entwined with engineering

Editor:

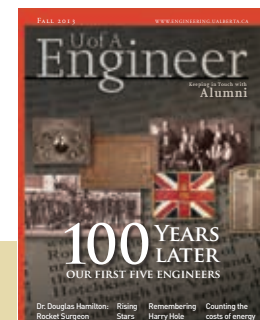
I am not on the *U of A Engineer* magazine circulation list but received a link to the Fall 2013 issue of your magazine. I read with great interest Ellen Schoeck's article on the first five graduates of the faculty (*100 Years Later: Our first five engineers, U of A Engineer, Fall 2013*). One of those first five engineering graduates was my grandfather, Joe Doze.

By the way, my father, Frank Ronaghan, was a graduate of your

faculty in 1948 and my mother graduated from the Faculty of Education a few years earlier. They were married at Old St. Stephen's College in 1945 the year my father enrolled. My uncle, Warren Doze, also graduated as an engineer from the U of A in 1945. I myself only attended the U of A one year, but after graduating from U of C worked on campus at Old St. Stephen's College for many years for the Alberta government.

I appreciate the Faculty of Engineering's respect for its alumni and the contributions they have made to the university as well as to the province during their working careers. The U of A has been a big part of my family's history. Thank you.

Brian
Ronaghan
Edmonton



LETTERS WELCOME

Please share your thoughts on any of the features and articles we publish. Your comments, questions, and opinions are always welcome! Send your letters via email to: richard.cairney@ualberta.ca.



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– Lindsey, P.Eng
U of A Alumni, Civil Engineering

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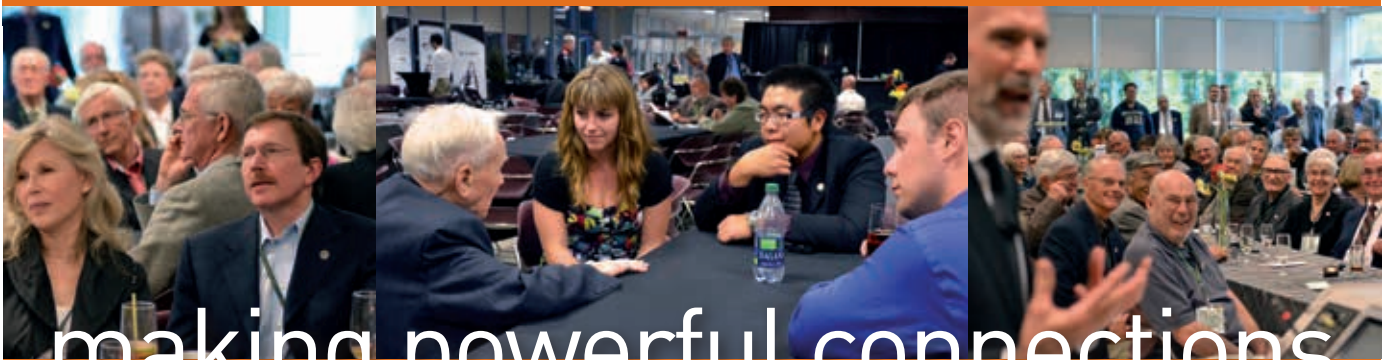
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By sponsoring U of A Faculty of Engineering events, you are making connections with a vast network of more than 18,000 alumni.



making powerful connections



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Find out how to team up with U of A Engineers today!

For information, contact Leanne Nickel, Manager, External Relations
403.718.4519 leanne.nickel@ualberta.ca

ENGG NEWS

We can see conservation by the dashboard light

Everyone looking at their utility bills at the end of each month has either cringed a little because of all the energy they've been wasting and paying for, or smiled with satisfaction because they've reduced their consumption and lowered the bill.

A similar effect could soon come into play at the Faculty of Engineering, with monitors being installed to help keep track of energy use in the Chemical and Materials Engineering Building and in the Innovation Centre for Engineering, presently under construction.

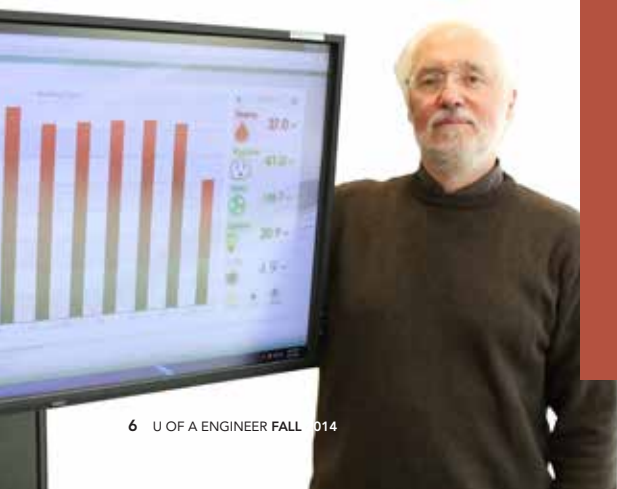
The costs of power, heat and water are huge for the university. In fact, the utility bill for the Chemical and Materials Engineering building hit \$1 million in 2008, the year before current, on-going renovations began. Now that the building is being renovated to labs only, energy use will increase—labs are energy-intensive facilities.

Now monitor screens are being installed in the elevator lobbies of levels 4, 5 and 6 of CME, according to Phil Haswell, the Faculty of Engineering's facilities director.

The new dashboard technology, which is also an innovation measure towards earning a LEED Gold Certification for the building, taps into energy consumption data collected at sub meters in the building and presents an array of information about every lab, including heat, air, plug load, water, and lights.

"People will know how much energy they're using in their labs and can reduce it," says Haswell. "If we save 10 per cent, that's a lot of money over time and it has a big impact on the environment."

Faculty of Engineering Facilities Director Phil Haswell reads energy consumption data from the Chemical Engineering Building, using new dashboard technology.



Governor General's Gold Medal is just a bonus for PhD graduate

Back in 2007, Shawn Sederberg completed his degree in electrical engineering with distinction, earning a solid 3.8 grade point average. That's a tough mark to reach, by anyone's reckoning. But Sederberg raised the bar when he completed his PhD earlier this year, winning the Governor General's Gold Medal. The prestigious award recognizes the doctoral graduate who achieves the highest scholarly standing at the University of Alberta.

"It's something I never really thought would happen. For my undergraduate degree, I was quite good as far as GPA, but I never saw myself winning a gold medal one day," he says. "It's a

real honour. I really worked hard during my PhD."

Now working as a post-doctoral fellow at the Max Planck Institute of Quantum Optics in Garching, Germany, Sederberg's PhD focused on plasmas and photonics, under the supervision of electrical engineering professor Abdul Elezzabi.

He conducted research exploring the possibility of running computers on light rather than electricity, in order to increase processing speed and decrease power consumption. The research results were tantalizing: Sederberg developed a nanoscale optical switch, an analogue to the electronic transistor, and demonstrated it could enable information

processing more than 100 times faster than today's computers.

He's now advancing his research in Germany, working at a new level.

"I'm part of a full-on scientific team of over 100 scientists working on related problems," he said. "They also have the facilities and infrastructure—it's a really good opportunity to be trained on some of these systems and to work with some brilliant scientists."

Eventually, he hopes to return to Canada to work in industry or academia.

For now, he's happily settling into his new routine and feeling excited about winning the gold medal.

Smart labels could save lives

Have you ever worried about getting salmonella or E. Coli poisoning from meat?

Anastasia Elias and Dominic Sauvageau, professors in the Department of Chemical and Materials Engineering, are developing smart materials to detect harmful microbes that cause food-borne illnesses before products reach consumers.

"Agriculture and food production is the second-largest industrial sector in Alberta and our smart materials will increase food safety and save time and money when testing for spoilage," Elias says.

"With the smart materials, food suppliers and even consumers will instantly be able to see if a product has been contaminated just by looking at the colour of the packaging," Sauvageau says.

The project involves the development and combination of three technologies: the stimuli-

responsive polymer (i.e. material), biological detection system, and food microbiology. The team has been programming the material to respond to the presence of pathogenic bacteria such as E. coli, salmonella, and Listeria, and to changes in temperature. The material responds by changing from blue to white, or from clear to cloudy.

"In Europe there are labels that detect temperature change, but temperature is only an indirect indicator of food spoilage. The key difference with our smart materials is that they will be able to directly indicate the presence of pathogens and help show exactly where it occurred in the supply chain," Elias explains.

The research team is supported by funding from the Alberta Meat and Livestock Agency.

The technology is currently awaiting patent approval.



The U of A Eco-Car team took first place at the Shell Eco-Marathon competition in Houston.



Students try, then try again, and win at Eco-Marathon

The Faculty of Engineering's U of A Eco-Car team won first place at an international competition, driving their vehicle to victory by getting the mileage equivalent of 618 mpg (0.1 L/100 km).

The team took top spot in the Urban Design – Hydrogen Cell category of the Shell Eco Marathon – Americas in Houston, Texas earlier this year. The category features consumer-friendly hydrogen fuel cell cars

designed and built by students from across North and South America.

After putting in two rounds on the six-mile track, being scored at 528 and 598.7 mpg, team members felt satisfied that they'd done the best they could and sat down for a celebratory lunch.

It wasn't long before talk turned to ways the team could squeeze even more efficiency

out of the engine and earn an even better score. Team leader Balazs Gyenes had a theory about performing a slight tweak on the engine set up to gain a substantial boost in energy efficiency.

Emboldened by their earlier performance and eager to move into more experimental territory, the team performed the adjustments Gyenes was suggesting and returned to the track. The car cruised to its

highest score of the day—more than double the engine efficiency of their only other competitor, from the University of Missouri.

"Our team was just five people at the beginning of the year and to build our finances and documentation and the structure and to grow in numbers the way we did was great," Gyenes, an engineering student. "I'm very proud of the whole team."

With a 4.0 GPA and 38 A+ grades, Mining grad wins top academic honour

It's ironic, but Doug Vis (Mining [Co-op] '14) credits the fact that he struggled through high school for earning the highest academic standing out of all of this spring's University of Alberta undergraduates, with a perfect 4.0 grade point average.

"I wasn't one of those students who cruised through high school. I had to study to get my grades up. I had to work hard, so I already knew how to study when I got here," he says.

Over the course of his studies, Vis earned straight As, including 38 courses in which he earned an A+.

He is this year's recipient of several prestigious awards: the APEGA Past President's Medal, for being the top engineering graduate; the Henry Birks and Sons Medal, awarded to the top engineering graduate based on grades and leadership; the Governor General's Silver Medal, awarded to the U of A's top three convocating undergraduates across the university; and the CD Howe Memorial Fellowship, an \$11,000 award given to the U of A's top undergraduate student.

Scoring straight As wasn't an all-consuming goal—he tried to ignore the fact that he was building a flawless record.

"I tried to just say 'Oh, it's no big deal,' but after a while, yeah, you don't want to mess things up."

With his studies over, Vis chose to spend a few months travelling. One of his professors has extended a standing offer to return to take on a PhD.

For now, he's excited about the fact that his education means he can develop a secure, rewarding career anywhere in the world.

"That's something that is really on my mind. With this degree, I can really travel around. That's exciting. I can start my career anywhere."



Mining engineering graduate Doug Vis and his proud mother share a smile on convocation day.

New food packaging materials being developed by Department of Chemical and Materials Engineering professors Anastasia Elias and Dominic Sauvageau can be used to alert producers and consumers to food contamination.



Judd Mah (Mechanical '99) (centre left, and in full lumberjack regalia below) delivered his best pitch for the Lumberjack, a doughnut he designed for the Tom Hortons Duelling Doughnuts competition. Celebrity panellists (L-R) Ben Mulroney, Jann Arden, pastry chef Anna Olson and actor Jason Priestly loved the snack, but it came in third place in national voting.

Mmmm bacon...Mmmm doughnuts

Mechanical engineer cooks up a sweet entry in Duelling Doughnuts competition

By Richard Cairney

Consider the common doughnut. We all do, from time to time: they're standard snacks used to lure us into meeting rooms—and we fall for them every time. But when Tim Hortons launched its second annual Duelling Doughnuts competition earlier this year, inviting doughnut connoisseurs to cook up ideas for new doughnuts, Judd Mah (Mechanical '99) couldn't resist the challenge of building a better snack. Following the popular (and probably true) culinary theory that “bacon makes everything better,” Mah devised a doughy delight that was sweet and savoury—and as Canadian as ‘eh’.

His entry was a simple apple cider doughnut topped with maple icing, bacon bits, graham cookie crumble and cream cheese icing lines. Dubbed the Lumberjack, this delicacy was chosen as one of the final four entries out of more than 75,000 submissions, ultimately finishing in third place.

Mah was disappointed but says the whole experience was exciting and worthwhile.

Mah, who works as a team lead with Williams Engineering in Edmonton, was flown to Toronto to present his doughnut to a panel of celebrity judges, including pastry chef Anna Olson, actor Jason Priestly, musician Jann Arden and TV personality Ben Mulroney. Tim Hortons had whipped up dozens of top duelling doughnuts and when he bit into the Lumberjack, Mah says, it tasted like sweet, sweet, victory.

“If you like bacon, this doughnut is for you,” Mah says. “You bite into it and you get a salty hit—they didn't chintz out on it at all. All the flavours were there. It was exactly what I imagined it to be.”

Mah says the doughnut was inspired by the big ‘Lumberjack’ breakfasts found on the menus of fine restaurants everywhere—especially at truck stops. You know the meal: you get a stack of pancakes, eggs, sausages, hash browns and bacon—and you drench it all in sweet maple syrup.

Interestingly, Mah's wife, Linda Lam, also made it to an early round of the competition, being invited by judges to make a video supporting her creation, the

Carnival Crave. Built on an apple cider doughnut, the treat has “a very playful mix of strawberry and candy bits.”

We'll never know how good it was, because Carnival Crave didn't make the cut. But Mah did get a taste of other finalists and thought they were good, but not quite Lumberjack good.

“I really wanted to try the Reeses pieces one, and it was OK,” he says of the eventual winning doughnut, called Love Reeses to Pieces. “It was pretty good but it didn't stand out. The Ice Cream Sundae stood out—that was pretty darn good. To me, the best were the Ice Cream Sundae and mine. The Lumberjack was unique and it had that savoury hit—to me it was logical.”

Don't get the impression that Mah has been left with a bad taste in his mouth because his recipe didn't garner enough votes (winners were selected in online nationwide voting). He says the experience was as awesome as Canadian bacon.

“The conversations I've been having with people about this have been great,” he says. “That's what has been the most fun about this—I entered never dreaming I'd get to the finals so the whole thing has been fantastic.”



WELCOME TO POP QUIZ

This is a new feature in *U of A Engineer* where you, graduates of our program, get to revisit the lessons you learned while at university. It doesn't matter how long ago you graduated—the laws of physics still haven't changed. With a little bit of work, you'll be able to answer these questions.

It has been a while since you completed the Materials Science II course. Almost every engineering student is required to complete this course so materials engineering professor John Nychka is confident you can find the solutions to these questions, which appeared on one of his mid-term exams last fall.

If you have any questions, visit our Pop Quiz website: engineering.ualberta.ca/PopQuiz



MATE 202: Materials Science II

Consider lead (Pb). Show all steps in calculations.

- Calculate the atomic radius (in nm) of Lead (Pb) based on its lattice parameter of 4.9489 Angstroms.
 - Calculate the theoretical density of Pb (g/cm^3).
-

True or False?

- T F** Ultimate tensile strength is the maximum force that can be sustained by a specimen before necking begins.
 - T F** FCC and BCC metals exhibit a ductile-to-brittle transition when tested under impact loading conditions.
 - T F** Hardness is an intrinsic material property.
-

The diagram below shows four different point defects. Name them.

1. _____

2. _____

3. _____

4. _____

Enhancing your career with a graduate degree

By Scott Rollans

A freshly minted bachelor's degree in engineering can instantly translate into a high-paying job in Alberta's energy sector. Not surprisingly, many engineering students choose to take jobs immediately after graduating. But those who stay in school, pursuing master's degrees and PhDs, can earn even greater dividends in the long term, both for themselves and for the economy as a whole.

That's the message delivered by the Canadian Graduate Engineering Consortium as it launches its second annual national recruiting tour this fall. Academic and industry representatives are visiting universities in six cities to encourage enrolment in engineering graduate studies.

The tour kicks off in Edmonton on Tuesday, Sept. 30, with an event that runs from 4 p.m.-8 p.m. in the ETLC solarium. The free session will include networking time and a panel discussion, along with snacks and refreshments.

The theme of this year's tour is "Dispelling the Myths About Grad Studies in Engineering." The idea is to address

common student misconceptions about the value of pursuing advanced degrees.

Those who think grad school won't pay off, financially or professionally, will learn otherwise. Those who doubt whether they have what it takes to go after a master's or PhD, or who worry that grad school will simply be "more of the same," will gain valuable insights and encouragement.

Young engineering grads should give graduate studies a serious look, says Steve Dew, the faculty's associate dean (research and planning). Postgraduate degree holders generally attract higher starting salaries and advance to leadership roles more quickly. "Additional education will provide substantial financial and job satisfaction returns over the course of their careers."

Canada needs to do a better job of developing its top engineering prospects, Dew argues. "Our ability to compete globally in a technological world depends on how sophisticated and innovative our engineers are." Dew points out that Canada is lagging in this area, producing fewer PhDs per capita than most other developed countries, he says.

Opportunities for engineers with advanced degrees continue to grow. A recent labour market report by Engineers Canada estimates that 95,000 Canadian engineers will retire by 2020. Many of the most seasoned experts are about to leave the workforce, taking with them decades of experience, knowledge and leadership.

The consortium came together when five leading Canadian engineering schools—the University of Alberta, the University of British Columbia, McGill University, the University of Toronto and the University of Waterloo—decided the problem was too complex for them to tackle individually.

The national tour aims to turn the tide.

By convincing more young engineers to stick with their studies for a few extra years, the consortium hopes to position Canada at the forefront of engineering innovation and expertise for decades to come.

UPCOMING GRADUATE STUDIES INFORMATION SESSIONS

The Canadian Graduate Engineering Consortium is hosting information sessions across the country to encourage practising engineers and engineering undergraduate students to consider graduate studies.

The theme of the events is "Dispelling the Myths About Grad Studies in Engineering."

UNIVERSITY OF ALBERTA SEPTEMBER 30, 4-8 P.M.

ETLC Solarium and Stanford Theatre
(NREF 2-003)

UNIVERSITY OF CALGARY OCTOBER 1, 5:30-8:30 P.M.

Dining Centre, Blue Room

UNIVERSITY OF BRITISH COLUMBIA OCTOBER 2, 4-8 P.M.

Fred Kaiser Atrium and Room 2020 –
2332 Main Mall

UNIVERSITY OF WATERLOO OCTOBER 7, 5-8:30 P.M.

E5 - Student Design Centre and Room
3101

UNIVERSITY OF TORONTO OCTOBER 8, 4-8 P.M.

Bahen Centre for Information Technology

MCGILL UNIVERSITY OCTOBER 9, 4:30-8:30 P.M.

McConnell Engineering Building Lobby

For detailed information about these sessions and the impact you can have with a graduate degree, visit:

[engineering.ualberta.ca/
GraduateResearchExcellence](http://engineering.ualberta.ca/GraduateResearchExcellence)



U of A Engineer

Graduate students can explore their interests in greater depth, find opportunities to connect with industry partners and have access to leading-edge equipment and other resources. The result is a foot up in career advancement.

Grad students' startup company is making waves

A team of graduate students is hitting the private sector with their sensing and robotics know-how

By Richard Cairney

As if they didn't have enough on their plates between studies and research projects, three Faculty of Engineering graduate students are now launching their own high-tech company.

Mechanical engineering graduate students Jamie Yuen (Mechanical '10), Nicolas Olmedo (Mechanical '10), and Stephen Dwyer (Mechanical '10) have formed Copperstone Technologies, a firm that designs and manufactures robotic and embedded systems for remote industrial and environmental monitoring.

"Basically, we design systems that collect data and process information from hard-to-access locations," says Yuen, a master's student who lives in Calgary, where the company is based.

The company's first client, BMI Technologies, manufactures after-market equipment that monitors the use of forklifts. The company found the engineering students through Mitacs, a not-for-profit organization that funds internships and fellowships, connecting industry with the knowledge and skills of graduate students.

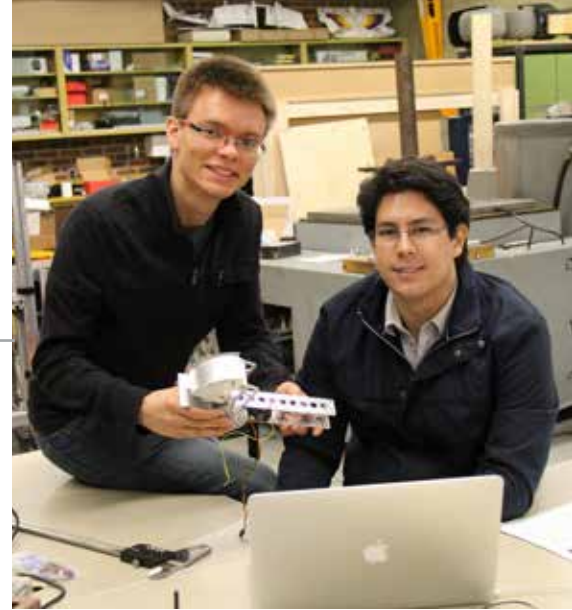
"When we were undergraduate students, none of us had the technical skills and knowledge we have now, which enables us to do what we are doing with Copperstone."

The trio has been involved in remote sensing, mechatronics, embedded systems, and robotics since their undergraduate days, and Copperstone is a direct extension of their earlier projects. They worked together on the U of A Aerial Robotics Group (UAARG), designing and building autonomous aircraft that would complete specific tasks, like searching for specific objects over a large area. Olmedo, who is pursuing a PhD, is currently involved in a project with his supervisor, mechanical engineering professor Mike Lipsett, designing and building a robotic rover-type vehicle that travels over drying tailings in Alberta's oil sands. The robotic vehicle goes where humans can't, collecting and transmitting information about the terrain it is inspecting.

Between studies and working with their current client, the three are also cultivating a client base. Nothing has been signed yet, but Copperstone has solid prospects for more contracts in its future.

The students say they couldn't have established the company if they hadn't first decided to pursue advanced engineering degrees. "When we were undergraduate students, none of us had the technical skills and knowledge we have now, which enables us to do what we are doing with Copperstone," says Yuen.

As graduate students, they also have access to several key resources—including Mitacs. Yuen took on a Mitacs internship in 2013, helping a Montreal company solve challenges it was having with an optical vision system on a drone aircraft. Later, the three students worked together on a Mitacs-sponsored project for their current client, BMI. When that sponsored project ended, the private commercial relationship took shape.



Graduate students Stephen Dwyer and Nicolas Olmedo, seen here at work on their research projects, have teamed up with fellow student Jamie Yuen to form a company that specializes in remote sensing, data collection and robotics.

Graduate school has given the trio other advantages as well. All three work on different projects under the supervision of Lipsett, an engineer already strongly connected with industry professionals. "Partly because he was in industry before he was a professor here, Dr. Lipsett has a great network of people in industry as well as academics," says Dwyer.

"As graduate students, we have access to resources like Mitacs and the labs, shops and equipment," adds Olmedo. "It's an environment where you can build prototypes."

Dwyer says graduate school presents students with more opportunities to learn, "and it gives you time for self-learning, to learn about the things you're interested in. You can have different interests as a graduate student. Your goal can be to do research and get articles published and like us, you can also be interested in honing your engineering skills and developing those soft skills that engineers need and explore product development and technology development."

Learn more about the students' company at the www.copperstonetech.com.

NIGHT OF THE LIVING BLOG

Michael Ross thought he was just writing a fun, witty blog post. Then it went viral.

Michael Ross (Civil '11, MSc '13) isn't a big fan of the zombie genre of movies, television and books. But he wanted to apply his engineering education to the zombie challenge. Supposing there were a zombie apocalypse—which Canadian city would you be safest in?

After evaluating 20 cities based on their proximity to military bases, gun ownership, obesity rates, population density, fitness levels and average temperature, Ross wrote up his findings, posted an entry to his Extreme Engineering blog (mikerobe007.ca).

"I wrote it on a Sunday and posted it Monday morning and by Monday afternoon, that one post already accounted for half the hits my blog has ever had," says Ross, who was soon inundated with interview requests from reporters across the country.

"I was fairly shocked. Normally my posts get shared with friends but they shared it with their friends and they shared it and it went on like that. Normally these posts just stay within my circle of engineering friends."

The blog's popularity spread faster than an invasion of zombies, with the article getting 142,000 page views in a week.

It is the biggest response Ross has ever

had to his blog, cheekily entitled Extreme Engineering, but wasn't the first time he has written attention-getting posts. After monitoring weather forecasts for a year, Ross posted a blog in June 2013 about where to get the most accurate predictions. The Weather Network came out on top, and Ross was featured in a story about his research on the station.

Another post dealt with the wild popularity of the springtime Roll Up The Rim contest by Tim Hortons. Ross calculated the odds of winning a car in the contest. He found that you'd have to buy 3.9 million cups of coffee to have a 'reasonable chance' (better than 50 per cent) of winning one of 40 cars up for grabs.

Other topics deal with politics, hockey, evolution and even extreme rock, paper, scissors.

In each case, Ross examines an issue and applies an engineer's problem-solving tools to learn more about the subject. Of course, Ross never expected the response that his zombie post provoked.

"The reaction has been really positive. Some people are taking it more seriously than I thought anyone would," says Ross, an engineer-in-training at Walters Chambers and Associates in Edmonton.

No one from St. John's, N.L., complained about finishing first (Edmonton was third, Calgary 10th and Windsor, Ont., came in dead last, in a manner of speaking).

But protests came in from Saskatoon, which placed seventh. While there is no Canadian Forces Base nearby, there is, apparently, an ammunition depot.

The blog's popularity spread faster than an invasion of zombies, with the article getting 142,000 page views in a week.

"They're claiming the ammo depot could improve their ranking," Ross says, adding that residents of Windsor also contacted him, saying they have some advantages not taken into consideration.

Could the outcry from some centres, that very quickness to defend a community, turn out to be a key to success against the zombie hordes? Is there a Feistiness Factor that could come into play?

"A lot of people are taking this more seriously than I was," Ross laughs. "They're quick to defend their honour so I'm sure they'd be just as quick defending themselves against zombies."

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Sowing the seeds of **safety**



When we drive across a bridge or step into an elevator, we trust that engineers have anticipated the many things that might go wrong, and have taken steps to ensure our safety. Companies rely on engineers to protect workers, the public and the environment, and to prevent costly disruptions to operations and damage to facilities. In the workplace, we rely on engineers to design tools, equipment and processes that allow us to go home safely at the end of every shift. And yet, tragedies still occur. According to the Association of Workers' Compensation Boards of Canada, there were 145 workplace fatalities in 2012 in Alberta alone. Across Canada, the figure reached 977.

But there are people who are working tirelessly to improve the situation. Throughout his career, Gord Winkel

(Mechanical '77, MSc '79) has reinforced a culture of safety among his professional peers and in industry. Now, as the Faculty of Engineering's chair and industrial professor of engineering safety and risk management, Winkel is working to ensure that safety and risk management education becomes a mandatory feature in a U of A engineering degree. It is, he says, "a core competency that every engineer needs to have."

It's also a competency that Winkel didn't have when he graduated. "Really, the whole notion of safety and risk management didn't exist in the curricula of those days," he says. "We're working to change that. We're working to equip every graduating engineer with this kind of bench strength and capability as they move forward in their careers."

In industry, risk management involves identifying and addressing factors that

might represent "risk exposures"—risks to a company's personnel, assets, ability to produce goods or deliver services, or to the environment. "It's just the right thing to do—it delivers on our moral imperative to protect society," observes Winkel. "And, as people have come to learn, safety and risk management is not a cost, it's an investment. It's an investment that provides a huge return to any enterprise that undertakes these kinds of techniques and practices. Safety and risk management has become a cornerstone for people to responsibly do business."

In 1988, Syncrude and other industry partners worked with the faculty to set up the safety and risk management program—it remains the first and only program of its kind in Canada. "We actually took one of our general managers, Laird Wilson, and seconded him to become the first (safety and risk management) professor

here,” recalls Winkel. “During that period we were also encouraged to contribute, as leaders in Syncrude. I was a guest lecturer at the University of Alberta for more than 10 years, supporting this particular program with some perspectives on loss management and safety achievement gained from the major industries that I was involved with.”

When the time was right, Winkel says, it felt natural to return to his alma mater full time. “As we moved forward, as I continued my career at Syncrude, it was always with an eye to retiring at some point and being able to give back—to share the learning and operational experience that could benefit our students.”

He joined the Faculty of Engineering in 2010 after a long and successful operations career at Syncrude Canada Ltd. He spent much of his professional life working with colleagues in petroleum and mining to improve safety and reduce risk. “Instrumental to my career was the fact that I worked at a company that encouraged learning and innovation in everything that we did,” Winkel says. “We were able to develop our own robust approaches—approaches that we are now able to reflect back to our students here at the university, and give them the benefit of that learning over time.”

Winkel has seen the program build momentum. “Currently, 200-plus students a year take engineering safety and risk management—a number that has been steadily growing since I arrived. That made it possible to bring on another industrial professor, John Cocchio, so now there are two of us delivering these courses.”

In the next few years, Winkel hopes to achieve his goal of expanding course offerings to include every engineering undergraduate, along with interested students from other faculties—an effort that will require hiring enough professors and staff to expand delivery by roughly a factor of five from what it is today.

Not surprisingly, an expanding program demands expanding resources. “We currently

have more than a dozen industry sponsors supporting our program,” says Winkel. “ConocoPhillips Canada is a leader in that community of interest. Their contribution will be instrumental in making our vision a reality.”

Winkel’s plans don’t stop there. “Our vision for the longer term is to also establish graduate-level courses, to provide new opportunities that support master’s of engineering degrees in our faculty.”

Meanwhile, the faculty’s leadership in engineering safety and risk management has spilled over into its overall institutional culture. The U of A board of governors has a safety, health and environment committee—Winkel sits as a member—and U of A President Indira Samarasekera has spoken publicly about making safety a core value for the institution. “The university has set a very strong tone, right from the top,” Winkel says.

Working with the university’s Risk Management Services Department, the committee has supported a number of initiatives, including personal protective equipment for laboratories, planned laboratory inspections, and opportunities for labs to learn from each other—to share the safety and risk management practices at different departments and faculties. Winkel also sits on a similar committee within the Faculty of Engineering. “So, it is a bigger picture, and one that we’re supporting right within our own institution,” he says.

“The ripple effect will be that we have people throughout industry with this fundamental knowledge.”



Gord Winkel (Mechanical '77, MSc '79), chair and industrial professor of engineering safety and risk management, wants safety and risk management to be a key feature of every U of A engineering degree.

The U of A is also keen on doing its part to build the field across Canada, says Winkel. “If we’re going to advance safety and risk management effectively, we also need to work as a university towards making this a reality on the wider national scene.” As a contributor to an organization called Minerva, the U of A is working with industry and with seven other universities to develop health and safety teaching modules that will bring risk management into engineering curricula across the country.

Winkel looks forward to the positive impact of making safety and risk management a core engineering curriculum requirement. He says the benefits will spread throughout society. “We will see, then, the university graduating upwards of a thousand students a year with this core competency. The ripple effect will be that we have people throughout industry with this fundamental knowledge.

“Safety and risk management will increasingly become part of the fabric of how we do work in this society, and the University of Alberta will be a leader in providing this kind of core competency to its students,” Winkel adds.

“As that happens, and as people become more comfortable and well-versed in the subject, it too will become part of our DNA here at the university. And we will have fulfilled our mandate to our students to set them up for success.”

Ralph Haas says the real measure of success in his career is the impact his former students have on industry.

King of the Roads: pavement pioneer earns top honours

By Rick Pilger

As part of the University of Alberta's Alumni Weekend this fall, Ralph Haas (Civil '61, MSc '63) will be honoured with a Distinguished Alumni Award—the premier award recognizing accomplishments of University of Alberta graduates. The award is the latest in a long list of honours accrued by Haas. Now a distinguished professor emeritus at the University of Waterloo, he has earned worldwide recognition for his pioneering efforts developing and implementing systems concepts and advancing technologies for managing networks of paved roads—foundational work that has carried over to the management of other infrastructure assets.

Over his career, Haas has received every major honour in his field. The only academic to be named an honorary life member of the Transportation Association of Canada, he received that body's



inaugural Distinguished Service Award in 2013. He was also the first recipient of the Canadian Society for Civil Engineering's Sandford Fleming Award, given to recognize outstanding contributions to the development and practice of transportation engineering in Canada. He is a fellow of the Canadian Academy of Engineering, of the American Society of Civil Engineers, and of the Royal Society of Canada, as well as one of the few Canadians honoured as a lifetime national associate of the U.S. National Academies. In 1999 he received Canada's highest civilian honour when he was named a member of the Order of Canada.

Using awards and honours as a measure, Haas's career has been nothing short of stellar. As satisfying as the recognition has been, Haas chooses a different yardstick by which to judge his career. A dedicated teacher, he looks to the success of his students as the meaningful measure of his impact. "I've always enjoyed teaching," says Haas, who has influenced thousands of undergraduate students in addition to directly supervising 20 PhD students and 30 master's students. "I see it as though if you have any legacy, it's the students you've had who have moved on to do very well and have great careers."

By that measure, Haas has certainly distinguished himself as well, says Susan Tighe, who chairs the Department of Civil Engineering at Waterloo. "His former students are certainly a strong testament to his contributions. They are working all over the world in senior positions of authority in academics and industry." Tighe is herself one of Haas's former students. She did both her master's and PhD degrees with Haas and succeeded him as the Norman W. McLeod Professor in Sustainable Pavement Engineering at Waterloo. (McLeod graduated from the U of A with a degree in Civil Engineering in 1931, was instrumental in developing new techniques in asphalt paving, and taught at Waterloo in the later years of his career.)

Tighe says that during his 30-plus years teaching at Waterloo, Haas always had a long-term interest in his students—a

relationship that began even before they arrived at Waterloo. "Ralph played a very big part in recruiting talented graduate students," she says. And when they arrived on campus, "he was very generous with his time, encouraging each and every one to be the best they could be." Later, she adds, Haas did his best to help his students launch their careers and was always willing to keep in touch thereafter.

For his accomplishments, including 10 books and 300 papers, Haas is widely known as the "father of pavement management," but he will always be simply "professor" to Li Ningyuan. "I call him professor still—I consider him, for me, a lifetime professor," says Ningyuan, the senior pavement engineer for the Ontario Ministry of Transportation.

Ningyuan, who did his first degrees at Changan University in his native China—the No. 1 university for transportation in Asia, he points out—recalls coming to Waterloo and being told, "Li, you are so lucky to be studying with Dr. Haas." He now appreciates the truth of that statement. "I was so lucky to have been his student," he says, pointing out that Haas "encouraged, accommodated and inspired" his students. "His students came from different backgrounds and he took time to figure out what would be best for each one," he recalls. And when difficult situations surfaced, "we always got encouragement from him He would help you see how to overcome your problems." When Ningyuan received his PhD in 1996, he was proud to accompany Haas to China. There, they visited eight locations and Haas was

a featured speaker at Changan University's anniversary celebrations.

Another of his students with whom Haas has maintained a lifelong relationship is Matt Karan, a former vice-president of Stantec who now sits on the board of advisers of the Centre for Pavement and Transportation Technology, the world-class research institute Haas founded in Waterloo. In 1977, the year he received his PhD from Waterloo, Karan and Haas, together with another of Haas's former students, put their technological advancements to work with the founding of a company called Pavement Management Systems Ltd. The firm, now merged into the Stantec group of companies, assesses the condition of roads, determining surface condition, structural integrity and estimated deterioration to recommend a work program to optimize money budgeted for road maintenance.

Karan says that after 40-some years he's still impressed by his former professor, now friend. In particular, he says, it is noteworthy that Haas can "talk the talk" from an academic and technical point of view but also "has a pretty good idea how the world really works." That duality was reflected in Haas's teaching, says Karan. "He had a balanced approach; everything wasn't just theoretical. There were real-life situations—it wasn't just a problem to pass a test."

And, on top of everything else, Haas genuinely cared for his students, says Karan, who marvels at Haas's ability to maintain a positive attitude. "I don't believe I've heard him say a bad thing about anybody," says Karan. "He's truly unique, just a very nice person."

**"I see it as though if you have any legacy,
it's the students you've had who have moved
on to do very well and great careers."**

Horizon Award winner is choosing his own path to improve cancer diagnostics

By Rick Pilger



In 2010, having just completed a post-doctoral fellowship at Stanford University, Govind Kaigala (Electrical '05, PhD '09) took a risk. Kaigala had done solid work at Stanford—his accomplishments included new assays for monitoring toxins in drinking water and novel electrokinetic techniques to rapidly detect bacteria in urine. He could have accepted a professorship at any of a number of top institutions. Ultimately, however, he turned down the relative security of these offers to accept a non-permanent position at IBM Research–Zurich. He has since become a permanent researcher at this facility.

A world-renowned industrial research institution, IBM Zurich is considered the birthplace of modern nanotechnology. Its researchers have earned a number of Nobel Prizes for advancements that include both the scanning tunnelling microscope and the atomic force microscope. Along with its stellar research record, IBM Zurich is known for hiring scientists infrequently and selectively. Thus when Kaigala received the offer to “come and do some good science,” he could not refuse.

And it has worked out well for both the institution and Kaigala. In the short time he has been there, Kaigala has set up

a new experimental laboratory that he designed, made functional for research in nanobiotechnology (microfluidics, microscopy, instrumentation and biochemistry), and assembled a research team that comprises engineers, post-doctoral fellows, PhD students, master’s students and interns. Their work applying micro- and nanotechnologies for cancer diagnostics and research has generated approximately 30 peer-reviewed journal articles and been featured in 45 conference proceedings. They have received 10 patents. The centrepiece of their efforts has been the development of technology to reduce



Govind Kaigala (Electrical '05, PhD '09) is part of a new generation of engineers applying nanotechnology to complex medical challenges.

photographs, and errors in exposure can lead to false positives or negatives.

The MFP technology being developed by Kaigala and his team involves an apparatus about the size of a tissue box connected to an eight-millimetre-wide diamond-shaped probe not unlike the nib of a fountain pen. This probe has a silicon microfluidic head incorporating two microchannels at each tip to precisely deliver the staining liquid to the tissue surface and then aspirate it to prevent the spreading and accumulation on the surface that can lead to errors. The precision of the MFP technology makes it possible to stain a very small section of tissue, allowing multiple stains on the same sample—important because it is increasingly being realized that significant variations exist within tumours, and these variations may be critical to designing effective treatment strategies.

During Alumni Weekend this fall, Kaigala is being given the U of A Alumni Horizon Award, which recognizes outstanding achievements by alumni early in their careers.

The MFP technology is already in early-stage testing at a Swiss hospital, which is “an amazing accomplishment for any technology, much less one this new,” says Linda Pilarski, a professor of oncology at the University of Alberta, who is anything but surprised at how rapidly Kaigala has gained international attention. Along with Chris Backhouse, a former U of A electrical and computer engineering professor, Pilarski co-supervised Kaigala when he was one of the U of A’s first cross-disciplinary PhD students trained to function comfortably in both biomedical and engineering aspects of their work. She says Kaigala came as a highly skilled engineer and “very quickly after entering my lab acquired an impressive understanding of the biomedical applications and applied them to microfluidic platforms.” She describes her former student, who earned

his PhD in electrical engineering and oncology in 2009, as “genuinely exceptional ... creative, intensely dedicated, persistent, hard working and able to develop innovative solutions to difficult problems.”

Pilarski and her lab staff continue to be in regular contact with Kaigala. “He has helped us solve a number of thorny issues in the developmental aspects of our work,” she says. Based on his creativity and hard work, as well as his significant accomplishments “of importance to science and society” so early in his career, Pilarski predicts a bright future for her former student, one that is sure to include major scientific awards. “I think that Govind has his feet firmly planted on that path.”

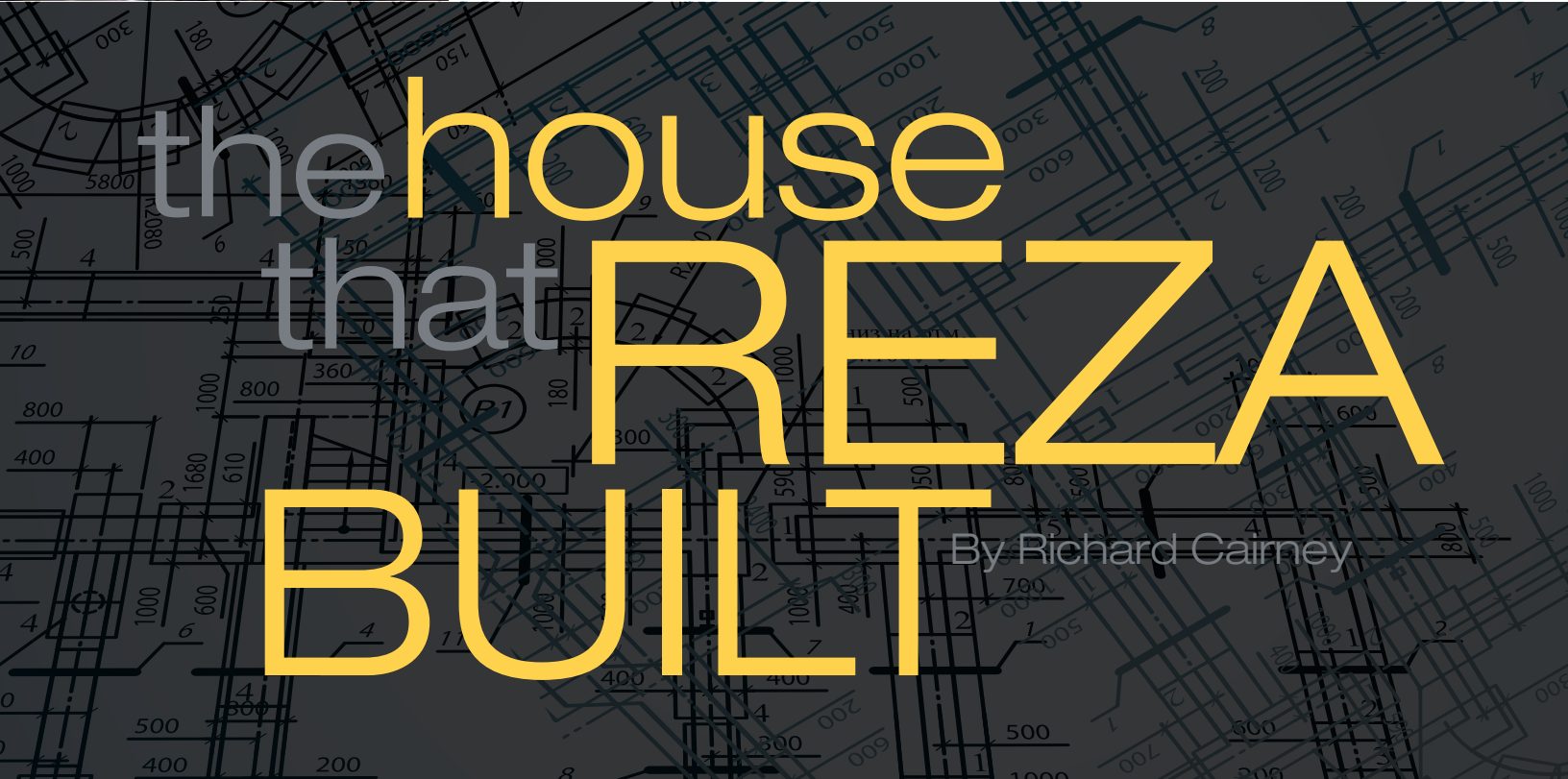
the subjectivity of tumour diagnostics. Their innovative microfluidic probe (MFP) technology uses nanolitre volumes of liquids to perform local biochemistries on cell, tissue and other biological surfaces at the micrometre scale.

Critical to the detection of cancer is the analysis of a patient’s biopsy tissue sample, which sometimes can be as minute as the head of a pin. Typically, analysis is done through tissue staining, which involves binding a disease marker with an antibody that is then chemically coloured or stained on the tissue. Traditional tissue staining is a tedious process not unlike developing

“[Kaigala is] genuinely exceptional... creative, intensely dedicated, persistent, hard working and able to develop innovative solutions to difficult problems.”

Landmark Group of Homes CEO Reza Nasseri chats with an employee at the company's 90,000-square-foot production facility. Automation inside the plant radically decreases waste, improves safety and working conditions and results in a high degree of accuracy and quality.





the house that BUILT REZA BUILT

By Richard Cairney



The construction industry in North America, particularly the residential construction sector, generates enormous amounts of waste. It's estimated that 25 per cent of Canada's greenhouse gas emissions are related to the construction and use of homes and other buildings. South of the border, the Environmental Protection Agency estimates that building construction, renovation, use and demolition account for approximately two-thirds of all non-industrial solid waste in the U.S.

But a new school of building science and engineering at the University of Alberta is about to change that.

Fuelled by a \$10-million gift from Reza and Sylvia Nasserri to the U of A Faculty of Engineering, the newly established Nasserri School of Building Science and Engineering will serve as a teaching and research centre in which engineering students, professors, researchers and staff will focus on improving the use of materials and energy in the design and construction of homes and commercial buildings. Advances

made through this research will reduce environmental impact, enhance safety for workers and occupants, and increase the affordability of homes.

There is a clear need in the industry for waste reduction, better building quality and affordability. Homes of the future will need to be highly energy efficient and have healthy environments, and will increasingly be involved in producing their own energy and contributing power into the electricity grid. New systems and materials for insulation and energy storage require the expertise of materials and electrical engineers, while mechanical engineers are involved in the design of more efficient heating and cooling systems. Software engineering for wireless technology in homes will be in demand.

"When you think of everything involved in building a home, it crosses many boundaries, from the foundations and concrete work to wiring and electrical appliances, plumbing and heating; and there are all sorts of materials," Dean of Engineering David Lynch explains. The

school touches on all aspects of building science and engineering, “which is really at the heart of creating sustainable building and construction practices.”

Lynch says the Nasseris’ “incredibly generous” gift creates an endowment that will live on in perpetuity. Interest generated from the endowment will support the hiring of new professors and the creation of research chairs, and enhance education opportunities for undergraduate and graduate students.

“To see waste, for me— it’s incredible. There is a callousness to it.”

Reza Nasser (Electrical ’70) is the founder and CEO of Landmark Group of Builders. For several years he has been finding ways to eliminate waste in the construction industry and has discovered

that through industrialization of the construction process—building some parts of buildings in a plant then assembling them on site—dramatically reduces waste and greenhouse gas emissions.

Landmark’s Edmonton building facility is a wonder of automation. The 90,000-square-foot plant builds about 3-1/2 houses per day. Computer-controlled machines are programmed to know how many walls of varying sizes are to be built during a day, how many window and door openings need to be cut into those walls, and even where holes need to be drilled into studs and joists for plumbing and electrical services. The computer determines how to make all of these cuts creating the least amount of waste. Boards are nailed into place with less than one millimetre of variation. Everything fits snugly. Verandas and decks are built in the plant; even entire roofs are assembled and shingled indoors. Parts are tagged with labels that detail not merely which construction site they are destined for, but also which room on which floor of the building they are needed in. In some cases, siding is already

applied to external walls; Nasser says that by the spring of 2015, most of the walls will be drywalled and taped before leaving the plant.

Waste reduction is one of Nasser’s goals; another is worker safety. Inside the plant, roofers work just a few feet off the floor, protected from the elements and hazards like slippery surfaces and ladders or scaffolding positioned on uneven surfaces.

If waste is reduced in the construction industry, there would be less demand for products upstream in the supply chain, he says. If less wood were wasted at construction sites, fewer trees would have to be harvested and fewer trucks required to haul them, and less fuel would be burned. What happens on a construction site, he says, affects everything upstream as well as downstream.

“An ounce of waste (on a construction site) looks like an ounce of waste but it’s tons,” he says. “My motivation is to lower carbon emissions and waste associated with residential construction, to increase sustainability and to improve the quality of homes being built.”

new opportunities

Homes and commercial buildings in the future will have to change in order to reduce greenhouse gas emissions and building waste, increase energy efficiency and provide occupants with a healthy living environment.

Key changes to housing and building systems will occur in these areas:

Software design: There is limited software in the market today serving automated construction. As the industry moves toward automation, opportunities will emerge to spin off new software engineering businesses.

More efficient HVAC systems: This will be achieved through water conservation technologies and using renewable energy produced on site by solar systems, cogeneration, biomass, geothermal systems and other methods.

New systems and materials for insulation and energy storage: There are opportunities to create new, improved window systems with much greater energy efficiency, new insulation materials using polymeric compounds and other advanced materials, phase-change materials for solar energy capture and release, and improved batteries and super-capacitors for renewable energy storage.

Spinoff effects: As new construction technologies and manufacturing methods are implemented, waste and housing prices will fall. More and more industry members will be compelled to adopt these methods, building automated construction plants designed through this program for the North American market. As one example, Landmark Homes and Enspire Electronics have formed a company to develop (with the help of the Industrial Research Assistance Program of the Natural Sciences and Engineering Research Council of Canada) a wireless switch to replace the multitude of wired light switches in homes, and are supplying these switches to the market to further

develop other wireless devices. There is a huge market for such products across North America.

Wireless technology: This will have an important role in future housing by eliminating enormous amounts of wiring and by using wireless switches to manage home functions such as lighting, security and appliances, and enabling off-site control of these functions.

Energy production: A growing number of homes are supplying their own energy. This movement will improve to the point that individual homes and buildings are net contributors to the electricity grid.

“I want to make sure that this technology advances. If you push technology, you can cut the cycle of change down to 10 years or less. Now we have a school where we will educate people and develop technologies to reduce waste and produce better homes.”

— Reza Nasser

Nasseri (Electrical '70) is neither wasteful nor impulsive. He values measured, well thought-out actions based on evidence, and efficiency; that drives him to discover ways to minimize his environmental impact personally and in his business, and it demands that he share and promote practices that make the world better—even if it means giving away trade secrets to competitors. Nasseri believes some ideas are simply too important to be selfishly kept. He has come by these values honestly, learning from simpler lifestyles with no option of being wasteful while growing up in Iran, then through the experience of starting a new life with little more than the clothes on his back and the support of strangers.

Nasseri grew up in Isfahan, Iran, during the 1950s and early 1960s, far removed from the madness of mass consumerism. It seemed as though no one threw anything away. A friend of Reza's father, for instance, owned a bindery. He made notepads from scraps of paper left over from different jobs, finding a use and turning a profit from what might have been considered waste. When his family shopped for food, merchants wrapped perishable goods like cheese in washed leaves. Nothing was plastic.

Modern living is different. "To see waste, for me—it's incredible. There is a callousness to it," he says. It's something he has always wanted to change in his industry.

Working as a tour guide and meeting visitors to his country, Nasseri began to see opportunities around the world. He built friendships and pledges of support were offered—first from a couple in California (Nasseri had applied and been accepted to study at the University of Southern California). He eventually accepted an offer of assistance from Alex and Gail Slutker, prominent Edmontonians who owned the Trudeau's dry-cleaning chain, and former geology professor Lou Bayrock who, independent of each other, convinced him that the University of Alberta was among the best in the world.

Nasseri arrived in Edmonton in December 1964, with plans to study engineering at the University of Alberta. He had just \$75 in his pocket—and that was in U.S. currency which, at the time,



Dean of Engineering David Lynch presents Reza and Sylvia Nasseri with a gift during a public announcement of a \$10-million gift from the Nasseris. The donation is an endowed gift and will be used to establish the Nasseri School of Building Science and Engineering at the U of A Faculty of Engineering.

was trading for less than \$1 Canadian. Edmonton was much different than it is today, with a population just over 300,000. Bayrock picked him up at the airport and Nasseri stayed with the professor and his family for the first two weeks. Alex offered him a job at his dry-cleaning facility.

"There were only a couple of Iranians here at the time so it was a lonely life for quite some time," says Nasseri. He enrolled in the Faculty of Science during his first year and then transferred to engineering. He met his wife, Sylvia, while they were both studying at the U of A.

After graduating with his degree in electrical engineering, Nasseri worked as a researcher for three years and an instructor at NAIT for another three. Taking advantage of a wide range of experiences he'd had working with construction companies while he was a student, he dabbled in home building on the side. The year he earned more money building and selling homes, he left NAIT and began his career as a home builder. He flinched just once: during the depths of the recession of the early 1980s, the housing industry was devastated. "We lost everything," he says. "Everyone did." Nasseri found himself out of the office and back on construction sites, framing his own homes. At one point business was so bad, he

signed the company over to his brother and went back to work at NAIT but returned to his company after seven months because he loved home building.

The Nasseris established Landmark in 1977 under Kauveh Construction first and then Nasseri Construction. Landmark is a major player in the residential construction industry, building about 1,000 homes per year. It is the leader in construction automation in North America. In 1994 Reza was on a working trip in Germany, where he toured a building company where workers assembled parts of buildings in a plant, reducing waste and improving on quality. He was impressed. "Nothing was automated but everything was being done inside, like we do now. It was absolutely fascinating. It never really left me. I thought 'I want this to be my contribution to the industry. I want this to happen in our industry.'"

Inspired, Nasseri steered Landmark toward change. The company began its automation overhaul. He started a 7,000-square-foot prefab shop about 10 years ago as an experimental stepping stone to indoor manufacturing. Eight years ago he was approached by Mohamed Al-Hussein, a U of A civil engineering professor who was looking for industrial



Photo: Shutterstock

The production floor at the Landmark facility: clean, safe, and efficient.

partners interested in off-site construction. At the time, Nasserri was looking into precast foundation to enhance his business. He didn't immediately pay attention to the possibilities but Al-Hussein persisted, offering collaboration and graduate

students to do research on both concrete and wood off-site construction.

"He's a pit bull. He's persistent," Nasserri says of Al-Hussein, with whom he has developed a strong collaborative partnership and friendship. "He thinks of something and he brings people together and things start to happen. It's his gift. Look at what has happened in just eight years!"

The benefits to Landmark were apparent not only in the amount of waste reduced but also in the way the company thinks. Part of this is due to the qualifications of new staff—Landmark first hired Haito Yu, a former student of Al-Hussein's after completing his doctorate and has continued to employ engineers with graduate-level degrees.

"We have a lot of people here with PhDs and master's degrees," says Nasserri. "Working with students and the university has definitely been a great help because we started thinking about things scientifically and doing research and development of our own."

The impact on the company was remarkable.

"We became a sustainable company—that's a hard thing to do. But the essence

of what we are doing is so subtle. Can you imagine when this spreads across North America? We need to industrialize this industry. And there is an awful lot of interest. We are well on our way to building a plant in Calgary, a second plant in Edmonton and one in Phoenix, Ariz.

"There's an awful lot of interest in the industry but a lot of people are sitting on the fence. Some of them are asking 'Can you help us?' or 'Will you joint-venture with us?' They feel that they can't start this on their own, that there's too much risk. We were willing to accept losses to bring it to this level. In 10 years I want to see a housing industry that has changed substantially."

The automotive industry revolution began with one innovative and perceptive automaker, he notes, but in short order "other people built their own plants and all of a sudden autos were available to everyone.

"But where do we get our expertise from? We want to make it possible that when someone does step up and starts working in this direction they can find the right people—the people who have the education and the skills and the research experience. Hence the creation of the school."

educational and research impact

Construction of new homes and buildings is truly an interdisciplinary activity, and the educational and research opportunities envisioned for the Nasserri School of Building Science and Engineering will reflect that, by necessity.

The school will address industry innovations including automation, enhanced manufacturing processes, novel materials, alternative energy sources and storage, new design approaches, sensing and control of building environments, wireless and information technologies, and the creation of adaptive and assistive home and building environments.

These activities will be present in all departments in the Faculty of Engineering.

In the Department of Civil and Environmental Engineering, there is growing expertise in planning and scheduling of building processes; the Department of Mechanical Engineering is addressing energy efficiency of building systems, including heating, ventilation and air conditioning systems; in the Department of

Chemical and Materials Engineering, research is touching on energy and thermal storage and phase-change building materials; the Department of Electrical and Computer Engineering is providing research into wireless building components and control systems; and in the Department of Biomedical Engineering (and in other engineering departments) assistive and adaptive technologies are being developed to make homes safer and more comfortable for seniors and the disabled.

The Nasserri school will provide an organizational identity for U of A faculty, staff and engineering graduates across many disciplines who will be responsible for improving, disseminating and translating advances in the industrialization of residential and building construction into industrial practice.

Educating the next generation of engineers is at the heart of these research activities, enabling a complete, industry-wide shift in home and building design and manufacture.

"My dream," says Nasserri, "is that this school can create a platform to graduate engineers so that they can go around the world and build many of these plants here and everywhere else.

"In 10 years' time, the school will be a stepping stone for expanding industrialization, to give people the tools they need to avoid waste, and improve quality and reduce the cost of housing."

Mechanical engineering professor Kajsia Duke hosted two high school students in her lab over the summer, through the WISEST program.

The last 25 years have seen a slow increase in the number of women in engineering. The Faculty of Engineering and its alumni are working hard to speed that change.



U of A Engineer

women in engineering

“Women can do anything men can do. I don’t see why it should be dominated by males.”

This observation, offered by a Grade 11 girl spending her summer working in a Department of Mechanical Engineering biomedical research lab, is a tidy summation of the state of gender diversity in the engineering profession: why the imbalance?

Until the 1980s, the profession in North America was almost exclusively the domain of men. Engineers Canada reports that women accounted for just three per cent of nearly 120,000 engineers in Canada 25 years ago, in 1989. In 2013, 11.2 per cent of Canada’s 187,500 practising engineers were women. And across the country, more women are studying engineering.

Through student recruitment initiatives the U of A Faculty of Engineering speaks not only to those students for whom engineering is obviously a good fit, but also to those who may not understand that the best way they can have an impact on society is through engineering. We call out to the designers, inventors, thinkers and dreamers.

Our efforts to diversify the student body are making solid strides. Twenty-five years ago only 10 per cent of 1,996 U of A engineering undergraduates and 8.6 per cent of graduate students were women. In 2013, 21 per cent of our 4,202 undergrads

and 34.4 per cent of our 1,426 graduate students were women.

The Faculty of Engineering’s outreach programs are making a difference too, building girls’ interest, awareness and understanding of engineering, science and technology. For more than 20 years the faculty’s DiscoverE engineering, science and technology program has provided co-ed and all-girls programs, creating settings where girls feel comfortable asking questions, exploring new ideas, and working together to solve engineering challenges.

In 2009, the Girls, Engineering and Mentorship (GEM) Club was established for girls from Grade 3 – 9. GEM gives female engineering students opportunities to mentor these young girls who, in turn, discover the world of engineering and connect confidently with their own peers. After receiving overwhelmingly positive feedback from girls in a GEM session that taught basic computer programming, the faculty established the Girls Coding Club through DiscoverE. In

In 2013, 21 per cent of our 4,202 undergrads and 34.4 per cent of our 1,426 graduate students were women.

2013, DiscoverE became the first Canadian organization to win the prestigious Google RISE Award for its outreach achievements. This year, it became the first group to win the award twice—this time specifically for creating the Girls Coding Club.

The Faculty of Engineering also works with other groups, like Women in Scholarship, Engineering, Science and Technology (WISEST), which gives high school students opportunities to work in university research labs in fields traditionally dominated by males or females; and Cybermentor, a provincewide initiative that connects girls from Grade 6 – 12 with female mentors in the science, technology, engineering and math (STEM) fields.

The impact is undeniable. In 2013, 40 per cent of participants in DiscoverE camps were girls. The faculty also reaches out to other underrepresented groups, like Aboriginals and those living in remote communities, reaching more than 23,500 youth in 71 communities throughout northern Alberta and the Northwest Territories.

But what about engineering professionals themselves? What is being done in the profession and the workplace to level the playing field? In this issue, *U of A Engineer* presents three profiles of alumnae who are making a difference in their profession through formal and informal means.

person of influence

By Jessamyn Smith (as told to Mari Sasano)

Jessamyn Smith (Computer '02) tells us how she was inspired to pursue a career in engineering—through her own initiative, chance and the influence of those who'd gone before her.



Jennifer Roberts

As a kid, I was home-schooled, so I kind of got to do what I wanted. We lived out in the bush, so we didn't have electricity. We didn't have TVs or computers or anything like that.

And you know, it's funny—I was in second or third year of engineering, and my mom decided that it was time for me to go through my stuff from when I was a kid. The first year I'd gone to public school was

Grade 6, and they asked us what we wanted to be when we grew up. I do remember that I was quite entranced by the computers, in particular *Where in the World is Carmen Sandiego?* which was a popular game with many of us. And I had written that I wanted to be a computer mechanic.

I was actually enrolled to go into education with the thought of being a high school math and science teacher, and then I

started to feel a lot of doubt about that, so I actually withdrew from the program and all I did was English. So I did my English class and worked for several years as a short-order cook.

Once I got really miserable about being a cook, I started doing informal interviews with everyone I met. I'd ask them what they did for work, if they liked it, what was the job like. I was sitting at the legion and I

started talking to this guy who worked as a contractor in the oilfield. He had a PhD in engineering. His job sounded awesome. He worked a couple of days a week, it sounded fun, he made a lot of money, so I said, “Tell me more about this engineering thing.”

Later, I think it was one of my mother’s sisters whose husband worked at Weyerhaeuser—my memory is that they helped set up a meeting for me with four women engineers at Weyerhaeuser. Talking to them gave me a lot more confidence about entering the field. They were all such contented and confident women. It was very encouraging. One thing I was struck by, over and over, was how the engineers I met seemed to like their lives.

I enrolled at Grande Prairie Regional College for first year of engineering and I really liked the first-year programming course. It was so awesome, after all these years, I could make the computer do what I wanted. And I was drunk on the sense of power.

I chose this field partly because computer engineering was the hardest to get into, and I’m competitive. I had no idea what I was getting into. Second year was really, really hard.

I was lucky because my best friend was the best student in our year. He was an absolute measuring stick for ability. Guys would say things like, “Oh I did this assignment in three hours.” And I would start to think, “I’m so dumb—it took me all weekend!” And at one point, he said, “Nobody did that assignment in three hours. It’s not possible. It took me 4-½.” After that, I realized that men are trained to have this bravado and talk themselves up and women are trained to talk themselves down, and if you don’t know that, you start thinking you don’t know what you’re doing and you overestimate how good they are. And that can be quite bad, because sometimes men make terrible technical decisions. If no one challenges them, it’s not good.

I definitely identify as a feminist. I didn’t necessarily, for years. When you’re starting out in your career and you feel kind of vulnerable, you don’t tend to make such a

“They were all such contented and confident women. It was very encouraging. One thing I was struck by, over and over, was how the engineers I met seemed to like their lives.”

big deal out of things. And saying “I’m a feminist” is definitely one of those things that’s going to get some people’s hackles up, so I just didn’t talk about it. In my heart I always was—of course women should be equal to men. It’s wrong to think that you wouldn’t. And a few years ago, as I stopped feeling so vulnerable, I thought, “You know what? I can do this now.” As we get more established, then it’s up to us to make things better.

I do some stuff informally. I do a lot of random online coaching of people. I’m in a number of online groups, and whenever people are looking for jobs, and they’re not necessarily women—anyone who’s trying to get a job in tech—I help a lot of people with their resumés and their job applications.

At the more formal level, I’ve done a number of different things. I volunteer with Ladies Learning Code in Toronto, which is really a fun program. They do mostly one-day workshops and you don’t have to be a woman to attend, but it’s mostly women. I’ve also given a number of talks. I love giving talks to people and I have my different stories that I use to encourage people or to give them a sense of how things go. In particular, whenever I see girls or young women going into tech, I don’t want to predispose them to look for things that are bad, I don’t want them to think that it’s going to be terrible, but I also don’t want them to go in blind.

And then there’s my 15 minutes of Internet fame, a few years ago. The company I was working with at the time, some of the guys put a bot in our Internet Relay Chat (IRC) channel that would try to make “That’s what she said” jokes. It’s basic artificial intelligence, and it’s interesting programming to try to get a machine to make a joke, but of all the jokes to pick ... Really? After a while it gets annoying. A number of people had complained, but these guys were just not taking it seriously. I didn’t want to deal with it multiple times a day at work. When you’re the one woman in a channel of 30 men, you don’t want to be reminded of your gender at all, actually. You just want to work. So one Friday night, I had a brainwave. I made my own bot, and every time someone on the channel said, “That’s what she said,” my bot would say, “What she really said was,” and provide a quotation from a famous woman.

I was telling a friend of mine, who’s one of the founders of the Ada Initiative (a group dedicated to supporting women in technology), and she told me, “You have to put this on the Geek Feminism blog.” So I did, and it exploded. It went totally viral. I think I succeeded a little bit in changing the discourse in my field. Now, people reference it as a way of dealing with things that are obnoxious. I’d rather do it with humour. It’s been cited in a college course, it’s been cited at tech conferences. It’s pretty cool.

Someone has to take those steps (to support women interested in engineering, science and technology), and I recognized that while I was at the U of A.

The hallways are lined with photos of all the graduates, and there was one—I would always walk down the halls and glance at all the pictures and all of a sudden I was looking at one, and I’m pretty sure it was from 1935, and I said, “I think that’s a woman!” And I wondered so much who she was and what her story was because there wasn’t another woman for decades. She graduated in, I think, the electrical department, in 1935, and I think the next woman was in the late ’70s or early ’80s. It was a long time. It made me wonder. After that, I’d look up and think, “Whoever you were, you were awesome.”

a level playing field

By Mifi Purvis

Gail Powley wanted to ensure the engineering profession retained female engineers—so she led an initiative to make that happen.

“They say that paper makes good partnerships,” says Gail Powley. “Well, the same is true of policy.”

Powley (Chemical '84) is settled in over coffee at the Faculty Club on the U of A campus. The sun has just burst through a light summer rain and she's talking about the measures she and her colleagues have taken to keep more women working in the engineering profession. Her youthful looks and energy belie her 30 years as an engineer. Powley, vice-president of corporate development at Willowglen Systems, has a reputation as an adept manager, an expert at helping technology companies grow. Her work includes industrial automation, SCADA and flow computer solutions. “I wanted to make a difference,” she says of her career choice. “That's what engineers do.”

It turns out that making a difference is a thing for her.

In this case, she's referring to a policy developed by the Women in APEGA committee designed to help engineering firms retain talented employees, but it was chiefly aimed at ensuring female engineers have the support they need from employers during and following maternity leaves. The idea is to encourage women who have worked hard to become engineers, and whom companies have invested in, to stay in the profession.

The numbers are gradually changing, but Powley graduated into a field in which 90 per cent of her young colleagues were men. It was the mid-1980s, and women were making gains in professions traditionally held by men. “Oh well,” she thought. “Engineering will take care of itself—the profession will catch up.”

Doreen Giamrisios

Time passed and Powley built her career. She spent 11 years at a company in Ontario creating advanced control systems. Her husband, (Ron Unrau [(Computer '84)], earned a PhD, and when they started a family they moved home to Alberta. At the office and in the field, Powley was accustomed to being the only woman in the room. She patiently waited to see the groundswell of female grads she assumed would enter the workforce over time. They never materialized. In fact, the numbers got worse. Many young women who had worked hard to get into the field faced an inflexible workplace culture that they could not reconcile with family life, and they didn't return to engineering after their maternity leaves ended. It represented the loss of a highly educated and trained group and it was a drain on the brain trust of the profession. The turnover was also hard on a company's bottom line. Powley began to see that the workplace of most engineers, and most were men, was a holdover from a past era "structured with a single-income family in mind."

Changing the numbers meant changing the way companies approached leaves and other transitions. A mother to three teenage girls, Powley has managed the transition from mat leave to work, and she knows it can be tricky.

When her kids were small, she kept her workweek under 45 hours. "I continued to provide value to my employer but didn't worry about continuing at an accelerated rate in terms of my career aspirations." It was a matter of shifting gears and still climbing, not coasting.

Her employer recognized Powley's value and started an Edmonton office in order to keep her. After that company was acquired, she moved to another, Matrikon, and joined the management team. The company grew from 100 employees in two offices to 800 employees in 18 offices over several years.

Extended parental and other leaves are murky areas in which an employee is and is not a member of the company. If the leave is not managed well, "it can be like a severance," says Powley. "You pack your things, they walk you to the door, close down your email account and you

"Nothing is more interesting than having the opportunity to prove things are possible. This makes a difference, and I became an engineer to make a difference—that's what engineers do."

hand over your keys." Increasing retention became one of the ways Powley made a difference when she became the first chair of Women in APEGA in 2011.

Powley's male colleagues didn't understand how alienating a simple maternity leave could be to an employee. She worked closely with APEGA, notably Larry Staples, a committee member, and Len Shrimpton, APEGA's senior director for professional programs.

"All the outreach we had been doing until that point had not budged the numbers of female engineers," Staples says. "So the APEGA council set up Women in APEGA to look at the problem." Staples says engineering in the province has to take measurable, concrete steps to attract women. "First, for principles of gender equality," he says, "and second, the profession is growing like crazy."

There is no sound business case for creating a work culture that limits the profession to half the potential talent pool. Together, Staples, Powley, Shrimpton and the rest of the committee identified problems, set targets and began developing policies, generating best-practices guidelines that companies could use to increase retention. One of the results of their efforts is *Managing Transitions Before, During and After Leave: A Planning Resource Guide for Employees and Employers*.

The policy document encourages an employee's connection to the workplace,

including regular project updates, a mat leave buddy system with regular phone calls, invitations to work-related social functions, opportunities for professional development and access to company email. The committee's extended-leave policies are applicable to all engineers taking leave for any reason, be it for education, elderly care or sick leave.

Women in APEGA set the goal of 30 per cent female engineers in Alberta by 2030. Powley calls it "a great, aspirational target," the specifics of which are still in progress. (Female undergraduate enrolment in engineering programs was 21.4 per cent in 2011.) APEGA's involvement is crucial. "For an effort like this, you need the acknowledgement and support of an authoritative professional body, one that can influence the practices of industry."

Powley recently won the APEGA Women in Engineering and Geoscience Champion Award for her efforts. The award recognizes an individual or organization that has demonstrated noteworthy support for women in the profession.

There are two other groups of engineers Powley hopes to influence: engineers new to Alberta and engineers with advanced degrees. "Sometimes this group is seen as overqualified," Powley says. "With 71,000 registered members, APEGA is a good marketing tool." Networking events introduce professionals from these two groups to Alberta's burgeoning tech startups, which stand to benefit the most from their depth of expertise, enriching the local tech sector.

Powley also values partnerships with the U of A and other schools and the Canadian Heavy Oil Association (she helped found the Edmonton chapter and is the incoming president). "It's important to share knowledge and innovative technologies to learn how to develop our resources sustainably," she says.

"Nothing is more interesting than having the opportunity to prove things are possible. This makes a difference, and I became an engineer to make a difference—that's what engineers do."

the mentorship factor

By Mifi Purvis

Lorna Harron is having an impact on female engineers and future engineers through organization and mentorship



Demetri Giannitsios

Lorna Harron was always close to her grandfather, William Armstrong. Still, when he died in 1990, she learned a few new things about him. And even after his death, Armstrong continued to inspire her. “At his funeral in Belfast, Northern Ireland, I met a fellow who talked about how my grandfather helped him out during the Second World War,” says Harron (Metallurgical '95). “There was strict rationing of food, jobs were scarce, and this fellow had a young family to feed. He was

desperate and considering suicide.” Luckily the man met Armstrong, who offered him a day of work on his farm—and paid him a week’s wages. She heard similar stories from others about how encouraging and helpful Armstrong was to those who really needed it.

She’s recalling the event from her Enbridge office in downtown Edmonton, sun streaming in the window, catching on mementoes and photos of her other great interests—showing Bernese mountain dogs and Arabian/Anglo-Arabian/half-Arabian

Lorna Harron (Metallurgical '95) meets with just a few of the members of Femenin (females in engineering) working at the Edmonton Enbridge office.

horses. “I came away from his funeral with a strong understanding that it’s not just the things you accomplish that matter,” Harron says—a trace of a Belfast childhood still detectable in her speech, “but rather it is how you do those things that make an impact on the world.”

For Harron, it was a lesson in mentorship and that life takes many unforeseen twists and turns. If there is a typical path to becoming a metallurgical engineer, it isn't the one Harron, then a dental assistant, took.

It was the mid-1990s and Harron, who had recently left a bad marriage, was a single mother to a toddler. She did some academic upgrading and her boss at the dental clinic encouraged her to pursue dentistry, but just before the application deadline, she submitted an application to engineering. "My dad is a tradesman with a good understanding of what an engineer can do," she says, "and he encouraged me." And Harron had her younger sister to look up to. (Amanda Rosychuk (Electrical '90) preceded her sister in engineering and is now a senior vice-president at Epcor.)

Still, it wasn't easy. Harron was one of three women in her class. "I was lucky. The year prior to that, there was one," she says. She completed a combined MBA and master's in engineering in 1997. Her competing priorities taught her time management and the importance of working hard to carve out balance in her life. But it was tough and she vowed to help women who came after her. In her current position as senior manager, integrity technology advancement in pipeline integrity at Enbridge, and her volunteer roles as vice-chair of Women in APEGA (taking over as chair late in 2014) and as the Alberta/N.W.T. representative for Women in Engineering Canada, she finds herself in a position to influence others.

"Mentorship is natural," she says. "But it's time to move beyond mentorship into sponsorship. This is where we take ownership of advancing an individual's career, we take a vested interest in her success." Her employer sees the advantages. "There is a huge business case for having more women active at all levels in a company."

She's right. In the United States, the Department of Labor's Women's Bureau created the Glass Ceiling Commission (1991-96), which looked at women in the workforce. The commission found that companies have better financial performance in the long run than less-

"It's time to move beyond mentorship into sponsorship. This is where we take ownership of advancing an individual's career, we take a vested interest in her success."

diverse organizations. "It is not only a matter of fair play, but an economic imperative that the glass ceiling be shattered," the final report reads. "It matters to the bottom line for business and for future economic stability." The report cites studies, among them a survey of the Standard & Poor's 500 stock market index by Covenant Investment Management that found highly diverse workplaces had a return on investment that was more than double (18.3 per cent versus 7.9 per cent over five years) the return of those that had "shatterproof glass ceilings."

Harron lauds her employer of nine years, Enbridge, as a trailblazer in investing in women's careers. Enbridge got behind her when she started an employee resource group called Femenin (Females in Engineering) in 2012. She recognized the need for it when another female engineer at her company came to her with "loads of questions that she wasn't comfortable talking to her male supervisor about," Harron says. The woman was thinking of starting a family and had questions about career planning and advancement after parenthood. "I thought, 'If she has these questions, there are probably lots of others who do, too.'" So Harron developed Femenin as an employee resource to provide networking, support and professional development for female engineers at Enbridge. She recently won the 2014 APEGA Summit Award for Outstanding Mentor for her work in this group, and other efforts, notably Engineering Futures.

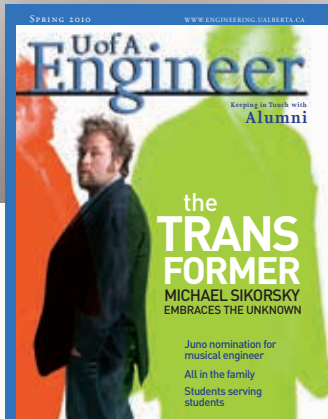
Engineering Futures helped generate interest and set career goals in engineering and sciences among a group of Aboriginal high school girls. It was a joint program overseen by Pamela Sparklingeyes, program manager for Aboriginal learning services at Edmonton Catholic Schools, and Lori Campbell, manager of diversity at Enbridge. Harron fostered Engineering Futures through Femenin with help from APEGA. The program builds on the momentum of a broader initiative called Braided Journeys, overseen by Sparklingeyes, which has improved graduation and engagement levels among Aboriginal students through coaching and mentorship. The first year was a resounding success for the girls, who had their knowledge of and interest in science careers evaluated before and after their involvement in Engineering Futures. Engineering Futures gave the girls a supportive environment and nurtured their curiosity, and for volunteers such as Harron, "It was one of those experiences you always wish you could have."

Harron's position at Enbridge and her volunteer roles have increased her desire to see women working at all levels in engineering, including senior management. The challenges include moving out of the traditional paradigm that engineering is a 24-7 job. "That's not a reasonable expectation of anyone," Harron says.

Outside the workday, Harron recently showed her Anglo-Arabian horse Soleya, winning a National Championship title on the North American show circuit—culminating years of effort. "I'll never forget the moment," she says. She leans back in her office chair and her eye moves across pictures of her horses, dogs the size of ponies, and her family. She shares an acreage home with her parents, Jeannie and Perry Harron, both 74, and her daughter, Crystal Thomson, 27.

"Engineering is a very rewarding career," she says. She has no doubt that more women will enter the profession, and she is taking steps to make it so. Her advice for young women entering the field: "As females, we need to put up our hands more, take on the field roles. We need to take risks."

Enter the Beaver's Den Creating an



In the Spring 2010 edition of *U of A Engineer*, we profiled Michael Sikorsky (Computer '96), who has founded the Calgary-based app design company Robots and Pencils with his wife, Camille. In the article, Sikorsky spoke about his desire to help engineering students learn to build their own companies and futures. (Read the article online at engineering.ualberta.ca/Alumni/StayConnected/PastIssues/Spring2010.)

That fall, Sikorsky was named as the Faculty of Engineering's Entrepreneur in Residence and established Startup School—a series of sessions for engineering students that began with a boot camp weekend on how to start a company, and culminated in an event called Beaver's Den, in which students made pitches and struck deals with investors.

We caught up with Sikorsky to find out what's happening with the initiative.

You've made a clear commitment to Startup School/Beaver's Den. Thinking back to the first year, what were your feelings? What worked and what needed to change?

I thought starting Startup School would be neat because when students near graduation they have big corporations talking to them about joining as EITs, and professors start recruiting students to pursue grad school, but no one really actively tries to pull students into entrepreneurship. I wanted to show students that starting a business straight out of university, or even during university, is possible and not as hard as it's often perceived to be.

I initially thought that students just needed a coach, someone to help them turn their ideas into viable businesses. The plan was to kick off each year with Startup School and then the students would be free to take the time to get started on their business with me coaching from the sidelines. The feedback from students was that they needed more teaching time. This is how Fireside Chats came about. Now students can participate in monthly information sessions hosted by a variety of entrepreneurs in addition to Startup School.



Fireside chats are an interesting outgrowth of the Startup School/Beaver's Den. How did they start up? What do you hope these sessions deliver to students? How important is it that the students hear stories other than your own?

I think it's important that students get to hear stories other than my own. There is no right way to start a business. If you talk to a room full of entrepreneurs, you're bound to get differing opinions. That's not a bad thing. Entrepreneurs should be opinionated! They've been through the trenches and have come out successful on the other side. It's great for students to get multiple views so they can find what works for them. As long as successful entrepreneurs are sharing their stories, there are great lessons to be learned.

There seems to be a community of student and alumni and industry/professional supporters growing up around Startup School/Beaver's Den. Is this something you'd hoped would happen? What role do these folks play during the Startup School year in terms of supporting you and in terms of supporting students?

I committed to running Startup School/Beaver's Den for five years because I thought that would be enough time to get it bootstrapped, so it's fantastic that we now have a community supporting it. It's important that this program isn't reliant on just one person driving it, but rather it's driven by a community of people who see value in it.

My role is solely focused on running Startup School and getting the judges together for Beaver's Den. Everything in between, which includes recruiting students to participate in the program, booking rooms, finding speakers for Fireside Chats, etc., happens because we have an amazing group of alumni and student volunteers as well as support from staff in the Faculty of Engineering. This program would not have grown as much as it has without the community supporting it.

Entrepreneurial Culture

Every spring, you've been able to convince some very busy, successful, highly regarded entrepreneurs to spend an entire day listening to pitches from engineering students. What motivates the Beaver's Den panellists? Why do they keep coming back?

It's simple—our judges come back year after year because it's fun. There's a great energy at Beaver's Den, and it's exciting to see students super passionate about entrepreneurship.

Also, it's a great way for entrepreneurs to give back to the community. There are very few people who can give students eight minutes of advice and potentially impact their careers in significant ways, but our judges can. They've worked their whole lives to be experts in starting a business, and this is their way of giving back.



What's in it for students who present at Beaver's Den?

One of the biggest takeaways for students who participate in Beaver's Den is the advice, and sometimes the business connections, that they get from our judges. More than likely, the students would never have the opportunity to get in front of these people to pitch their ideas. Beaver's Den is a safe place to do this, and the students get invaluable insight and honest feedback from really successful entrepreneurs.

I also think the students learn how to tell a succinct story, and this is a skill that they'll use throughout their careers. If you think about it, you always need to be able to communicate your ideas, whether it's pitching a new business or pitching an idea to your boss. If you can tell a great story and communicate your ideas clearly, people will get behind you.

How do you measure this initiative's success?

When the program was first launched, I really wanted to give the students rink time—time to work on their startup ideas with the intention of launching something real. This was partially inspired by a Charlie Parker quote: "If you don't live it, it won't come out of your horn. They teach you there's a boundary line to music. But, man, there's no boundary line to art." By giving students rink time, I wanted them to live like entrepreneurs without any boundaries restricting them.

However as we've grown Startup School/Beaver's Den, rather than just giving students rink time we're also shining a light on a possible career path that isn't really highlighted in the traditional education setting. It's showing another option and teaching the students entrepreneurial thinking skills that they can apply in their careers, whether they pursue entrepreneurial endeavours or take on more traditional roles following graduation. I measure our success by the number of students we can connect with and inspire to think differently.

What are your future plans for Startup School/Beaver's Den? How can other engineering alumni and professionals support this?

Over the last four years, Startup School/Beaver's Den has grown, thanks to the ideas and commitment from our volunteers, both alumni and students. The more stories we can share, the more mentors we can recruit and the more touch points students have, the better. So to anyone who wants to get involved, come on in. The door is wide open.

If you're interested in supporting the Entrepreneur-in-Residence program, contact leanne.nickel@ualberta.ca

Left: Michael Sikorsky celebrates with Beaver's Den winners Ryan Chee (an electrical engineering master's student) and Steven Zhang (Electrical '14). The duo won best pitch with their plans to develop a "smart home" package that will automatically operate lights and heat in your home without the hassle of having to program the system.

Above: Former Department of Electrical and Computer Engineering Chair Horacio Marquez and Dean of Engineering Dave Lynch serve as moderators at the Beaver's Den; panellists Dean Radomsky, Jim Bush and Leslie Roberts consider a student's pitch.

The airman's journey

Norman Reid went from destroying bridges to designing them.

By Suzanne Harris



Jimmy Jeong

Seen here at the British Columbia Aviation Museum in Victoria, B.C., Norman Reid (Civil '49, MSc '51) served valiantly as an airman during the Second World War. As an engineer, he designed and built bridges, rose to the presidency of Haddin, Davis and Brown. He also earned his accreditation as a chartered arbitrator. He and his wife recently established the Norman and Tess Reid Family Graduate Scholarship in Engineering.

Bridges connect. They allow us to overcome barriers, traverse rough terrain. They connect communities, and create opportunities for growth and exploration. They are the legacies of those who had the forethought to fashion them.

And in times of conflict they become strategic targets, their destruction crippling movement and hampering communication.

It was 1941 when Norman Reid (Civil '49, MSc '51) graduated from Victoria High School in Edmonton. The war was on, and although his parents expected him to go to university, Reid joined the Royal Canadian Air Force and was sent to Europe.

There, he served with the U.K.'s Royal Air Force, where one of his key roles was to locate railway bridges vital to the transport of petroleum, and destroy them.

During his tour, he survived 42 night combat bomber operations. Twice, the plane he was in was shot down: once over Italy, and once—in May 1944—over Romania.

"I was on a night operation going after a rail bridge at low level when we were hit by ground fire. We managed to get the burning plane across the Danube River from Romania into Serbia." He saved himself by parachute and was able to make contact with the underground resistance of the Chetniks, the "Fighting Guerrillas" of Gen. Draža Mihailovi. With their help, he hid from the Gestapo and the SS for nearly four months. The oil refineries near Ploesti, Romania, and the rail bridges that moved this supply were strategic targets during the war and were heavily defended. As a result, there were many downed Allied airmen in the Balkans. Some of them became POWs; some, like Reid, had been saved by the Chetniks. Eventually Reid and a small group of men planned a daring escape that became one of the most outstanding—and still classified—missions of the Second World War, as well as a model for future rescues.

When the war ended, the RCAF provided a preparation period to help veterans re-enter civilian life. When it came to careers, the vets were reminded that the War Act provided that the employer they left when they joined the Forces must hold their job open for them.

"I was aware of that, but somehow I didn't think my *Edmonton Journal* paper route was going to cut it," Reid quips.

It was clear that his skills and experience in the Air Force, all the math capability that one needs to be a skilled navigator and multi-engine pilot, aligned with engineering.

In his youth, his fascination with planes led him to think he might like to be an aeronautical engineer. But when Reid began classes at the University of Alberta after his discharge, mechanical engineering wasn't taught there. He went into civil engineering instead.

"It's a paradox that during the war I destroyed bridges, and as a career I ended up designing them and overseeing their construction," says Reid.

After graduating with his master's degree, he joined the firm Haddin, Davis & Brown in Calgary as a structural engineer, foremost as a bridge-building expert. He became president of the company. Reid also contributed to some metaphorical bridge-building: Because he saw a need to arbitrate construction contract disputes, Reid returned to university for legal courses and earned the designation of chartered arbitrator. For over 20 years, Reid provided arbitration and technical counsel to government and the private sector.

He remained involved with the RCAF over the years and served as a director of the Royal Air Forces Escaping Society. Reid was retained to lecture combat airmen of NATO, the United States Air Force and RAF on subsistence and rescue preparation when behind enemy lines.

Now 91, Reid is building bridges of another sort: He and his wife recently established the Norman and Tess Reid Family Graduate Scholarship in Engineering, awarded annually to a graduate student conducting research in structural engineering.

"Canada, engineering, university have all been very, very good to me," says Reid. "All my family are university graduates. I am such a firm believer in the value of higher education. We all are."

What he really wanted was to establish a scholarship for the postgraduate phase.

"I was so impressed by what happened

"It's ironic that during the war I destroyed bridges, and as a career I ended up designing them and overseeing their construction."

when I did my own thesis," he says. "Con-Force Ltd. in Calgary heard I was going into the research and application of pre-stressed concrete. They were already in casting ordinary reinforced concrete but knew from early advancements in Europe the advantages of pre-stressing concrete. They provided money for some of the equipment and instrumentation that I required for carrying out the research.

"What interested me was this: I ultimately proved through tests the value of pre-stressed concrete in applications to construction in Canada. And from that, Con-Force was able to advance into pre-stressed concrete units."

He acknowledges that it was on a modest scale to begin with. "Nevertheless, it was the beginning of an industry of larger and greater things.

"I was so impressed that formal education could be coalesced with private enterprise right from the early stages, and in the final analysis, add to Canada's capability in the production of gross capital and services."

The Reid family scholarship has been awarded annually since 2012. Reid and his wife receive cards from recipients sharing stories of how the scholarship helped them do something they were otherwise unable to.

The couple has recently moved, and though they have no mantel now on which to put them, the cards remain on display, reminders of futures being built, the legacies of connections.

Helping engineers in the rough



Bob Spencer worked as a mining engineer for more than 40 years—and played a key role in establishing a fund to help enhance mining engineering education.

By Richard Cairney

An elegantly framed print of the Con Mine in the Northwest Territories hangs in a busy but well-appointed office at Bob Spencer's home in Coldstream, B.C. The print is a reminder of the first mine site he worked at as an engineer, a memento of a rewarding 43-year career with Cominco. His home in the Okanagan Valley is a world apart from the North. Despite its name, there's not much that's cold about Coldstream, situated on the

north shore of Kalamalka Lake, bordering Vernon. The area is a tourism hub but the condo that Spencer and his present partner Thelma 'Tim' Irvine have made their home is quietly tucked a safe distance from Kal Beach—a pretty locale that, during the summer months, is crowded by tourists who have made the trip here for a little fun and sun.

Spencer's own travels, to the North, began during his final year of engineering

Bob Spencer (Mining '48) had a long and rewarding career as a mining engineer with Cominco, but felt more could be done to help engineering students. He and his fellow graduates established a fund to enhance the education of mining engineers at the U of A.

studies in 1948. He and two of his classmates were interviewed by Cominco in January that year, and hired to begin immediately after graduation. The idea was that each would join the company's engineering training program, which gave engineering graduates a chance to work in various operations within the company. Spencer was later offered work at the Con Mine. An opportunity to head north for an extra \$10 per month, plus a \$10 per month northern living allowance, was irresistible. Spencer accepted.

Spencer was based at the mining camp, a short drive out of Yellowknife, N.W.T. After nearly a year, he was asked to travel to Pine Point, located on the south shore of Great Slave Lake, which at that time was part of the Cominco Exploration program. He was there for two years.

The son of a CNR brakeman-conductor and a school teacher, Spencer was born in the town of Stettler, Alta., and grew up in the nearby town of Big Valley. When he was in high school, the family moved to the small town of Mirror. The high school classes he wanted to study weren't offered there, so Spencer transferred to school in Stettler, living with family and sometimes riding his bicycle home on weekends.

As a youngster his passions were geology and chemistry and he received encouragement from teachers. One teacher led students on field trips to the Red Deer River, where fossils were in abundance. Another took students on a tour of the local coal mine. During his high school days the school principal, a graduate of Queen's University, suggested Spencer study chemistry there.

"He was after me to go to Queen's but that was too far," Spencer recalls. "I said

“Why should I go to Queen’s when I can go to Alberta?”

The Second World War raged on when Spencer and his engineering classmates arrived at the University of Alberta. He was directed to join the campus Navy reservists “because a lot of fellas from Big Valley had gone into the Navy and said it was pretty interesting.” A single trip on a corvette off the coast of Vancouver Island the following summer convinced him otherwise. “It wasn’t for me,” he says. “After being on the sea, I was not interested.” As part of this unit, Spencer marched with the Navy during the VE Day parade in Victoria, B.C.

With servicemen returning from service overseas, the number of students on campus began to swell. Drafting classes continued to be held in Convocation Hall, and engineering classes were scattered across campus, but were concentrated in the North and South Labs.

Spencer chose to study mining engineering at the beginning of his second year of studies because of his interest in geology. It helped, too, that mining companies were recruiting students for summer jobs. He took summer jobs working underground as a labourer then as an engineer’s assistant at gold and zinc mines near Salmo and New Denver, in south-central B.C. After graduating, he joined Cominco.

“By establishing this fund, we’re able to put money toward advancing the individual, to help them along, to help them have more well-rounded experiences.”

He spent 43 years with the company, including the 10 years in Yellowknife, where he met and married Peggy Watson, who died in 2001. He also spent five years in Thunder Bay, Ont., a base from which he spent time in the Maritimes looking for new deposits. While living in Montreal, Que., he continued exploration for the company in Eastern Canada and was also in the exploration office in Toronto, Ont. These positions gave him opportunities to visit Greenland, Europe and Polynesia. When the head office moved to Vancouver, B.C., in 1970, he moved there as manager of exploration administration. He retired in 1991 and was then able to pursue his interest in philatelics.

While moving across Canada he enjoyed finding friends everywhere through work and also through U of A alumni chapters in Toronto, Montreal and Vancouver. He returned to campus in 1973 for his 25th graduation reunion and served as class organizer for alumni reunions in 1998, for

his 50th anniversary, and in 2008 and 2013 for the class’s 60th and 65th anniversaries.

During his career he developed an interest in the need for additional education and the need to expand one’s expertise. He was, therefore, instrumental in establishing the Miners ’48 Engineering Enhancement Fund, and made a substantial donation to the Faculty of Engineering for this purpose, to which other engineers can donate.

Spencer says that when he found himself working in remote locations right after graduation, he became aware that he wasn’t entirely prepared for issues outside of engineering—and he feels strongly that the fund he and his classmates set up will help young engineers.

“When I think of my initial work, I recall being off by yourself and suddenly people are looking to you for answers about everything—and often very little of it has to do with engineering.

“By establishing this fund, we’re able to put money toward advancing the individual, to help them along, to help them have more well-rounded experiences,” he says.

Spencer has received letters of thanks from some beneficiaries of the fund, expressing their thanks.

“It’s nice to know that we’ve been able to make a difference in their lives, to give them an additional educational experience.”

TAKING PRIDE IN ACHIEVEMENT

KUDOS



Burghardt, Greg PEng
(Civil '88, MBA '91)

Has been listed among Edmonton’s 20 Business Leaders of Tomorrow by Business in Edmonton magazine. Burghardt is CEO of Arrow Engineering. The firm is an active supporter of HVAC research in the Faculty of Engineering. It has more than 75 employees providing mechanical, civil and electrical engineering services through its offices in Edmonton, Calgary and Saskatoon.

Faulkner, Gary PEng
(Mechanical '63, MSc Mechanical '66)

Has received a 2014 SAGE award in the category of Science and Technology from the Seniors Association of Greater Edmonton. Faulkner is the director of research and technology development for the Glenrose Rehabilitation Hospital in Edmonton. His recent work has focused on the development of “smart condos” that assist seniors in continuing to live independently following rehabilitation, through the use of sensors and other methods that provide information on their progress and activities to health professionals.



Li, Lijun PEng
Has been elected as a Fellow of the American Society

of Materials. The honour is in recognition of Li’s “contributions to our understanding of the welding metallurgy of steels and superalloys and of the fundamental mechanisms that explain ultrasonic consolidation in metal-matrix composites.” Li is a professor in the Department of Chemical and Materials Engineering.

Meredith, Robert (Jack) PEng
(Mechanical, '71)

Has been appointed as a LEED Fellow by the U.S. Green Building Council, in recognition of exceptional contributions to the green building community and dedication to a healthy, sustainable future. Nominees for the designation undergo a thorough portfolio review. To date, the USGBC has appointed 115 professionals as LEED Fellows.



Nychka, John PEng
(Metallurgical [Co-op] '97)

Has won the 2014 Silver Medal Award from ASM International. An award-winning materials engineering professor in the Department of Chemical and Materials Engineering, Nychka was nominated by the local ASM International chapter – ASM Edmonton. The honour is awarded to recognize Nychka’s “innovative and substantial contributions to the pedagogy, style, and structure of education and professional stewardship in Materials Science and Engineering.”

Do you have news to share? Send your news of awards, appointments and other successes to engineer.alum@ualberta.ca

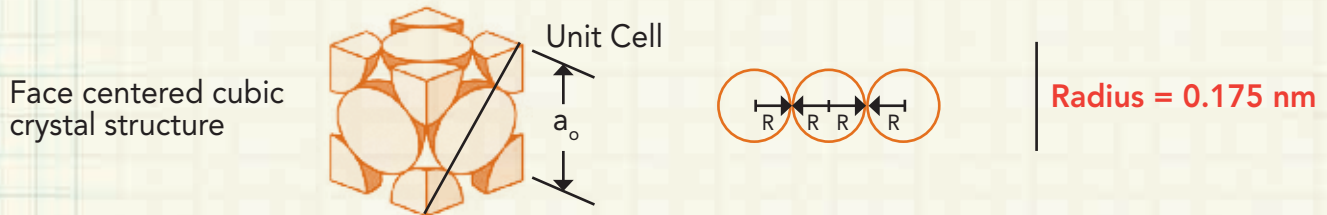


MATE 202: Materials Science II

a) Calculate the atomic radius (in nm) of Lead (Pb) based on its lattice parameter of 4.9489 Angstroms.

Lead (Pb) is FCC, $a_0 = 4.9489 \text{ \AA}$.

In FCC, $a_0 = 2\sqrt{2}R$; therefore, $R = \frac{a_0}{2\sqrt{2}} = \approx 1.75 \text{ \AA} = 0.175 \text{ nm}$



b) Calculate the theoretical density of Pb (g/cm^3).

$$\rho = \frac{nM}{vN_A} = \frac{4 \text{ atoms} \times 207.19 \text{ g/mol}}{(4.9489 \times 10^{-8})^3 \text{ cm}^3 \times 6.023 \times 10^{23} \text{ atoms/mol}} = 11.35 \text{ (g/cm}^3\text{)}$$

of atoms/unit cell

Molar mass

Volume of unit cell

Avogadro's #

Density = 11.35 (g/cm^3)

True or False?

- a) **T** **F** Strength is a stress, not a force! Tricky!
- b) **T** **F** Of FCC and BCC metals, only BCC metals (such as plain carbon steels) exhibit a ductile-to-brittle transition; when it is too cold certain steels (e.g., AISI 1018) can become brittle and fracture under impact, whereas aluminum alloys and certain grades of stainless steel (e.g., austenitic SS304 and 316) retain a great deal of their toughness to cryogenic temperatures. All due to crystallography!
- c) **T** **F** Hardness is not an intrinsic material property. Hardness is a measure of a material's resistance to *localized* plastic deformation. Hardness depends on complex elastic and plastic deformation response, is load dependent, can vary from place to place, and can depend on how much of a material is tested. (True intrinsic properties are invariant of the volume of material tested.)

Name the four different point defects.

- Substitutional Impurity
- Interstitial Impurity
- Self Interstitial
- Vacancy

Answers to questions
from page 9

Worth family establishes memorial fund for railway research

One of Canada's most ardent railway engineers, Arthur (Art) Willmott Worth, passed away January 17, 2014, after a brave battle with pancreatic cancer. He was 79. A champion of Canada's railroad community, in which he worked for over five decades, Art had an unwavering passion for the industry.

To honour Art's life, his family has recently set up a fund to further Canadian rail research at the University of Alberta. The Department of Civil and Environmental Engineering is home to the Canadian Rail Research Laboratory (CaRRL)—Canada's premier education and research program in railway engineering. The Worth Memorial Fund will support outstanding graduate students working on railway research projects that will optimize Canada's rail operations in the areas of ground hazards and winter service reliability and capacity. For more information on CaRRL, visit www.carrl.ca.

To donate online, use the giving form available at www.giving.ualberta.ca, indicating that your donation is in memory of Arthur Worth.

Alternatively, send your cheque made out to the University of Alberta, noting 'In Memory of Arthur Worth' to:

The Worth Memorial Fund
c/o Dept. of Civil and Environmental Engineering, University of Alberta
Markin/CNRL Natural Resources Engineering Facility, 9105 116th St.
Edmonton, AB, Canada, T6G 2W2



'Brilliant' engineer played major role in advancing space exploration

H.F. Lloyd Pinkney (Engineering Physics '52), who developed the technology that serves as the "eyes" for the Canadarm 2/Dextre robotic arms aboard the International Space Station, died May 3. He was 83.

"He had a gifted and brilliant mind, and very quietly he made major contributions throughout his career," says longtime friend and colleague Garry Lindberg (Engineering Physics '60, DSc [Hon.] '12).

Lindberg and Pinkney met Jan. 13, 1964, on Lindberg's first day working for the National Research Council in Ottawa. Through their shared *alma mater*, professional interests and car-pooling to and from work, the two became lasting friends. Lindberg went on to lead the team that designed and built the Canadarm for NASA's space shuttles, with Pinkney devising a backup set of "eyes" to help astronauts operate the giant robotic arm.

To design the space vision system (SVS), Pinkney drew upon road safety research he'd conducted years earlier. Given the task of designing safer roadside barriers,

Pinkney had used photogrammetry to fully understand a car's position as it struck a barrier.

"It was during the course of these experiments that he had the first inkling of how to measure targets using manual photogrammetry techniques," Lindberg says. "It was the start of his ideas to do real-time photogrammetry as a backup for the Canadarm."

His work on the SVS was considered a major advancement in space technology. The SVS enables the Canadarm and the Canadarm 2/Dextre to handle payloads that are out of the sight of astronauts operating the giant robotic arms. It also played an essential role in the construction of the International Space Station.

Although SVS was a backup system, Canadian astronaut Steve MacLean used the system during a space shuttle mission in 1992 and discovered it performed flawlessly.

Pinkney was instrumental in advancing Canada as a leader in space technology. He began his 44-year career with the National Research Council of Canada in 1952. While working at the NRC, he completed his master's and PhD in engineering mechanics at Stanford University. From 1996-2002, he worked as a scientific-engineering consultant with Neptec Design Group Ltd. in Kanata, Ont.

He is survived by his wife, Mary Gayle; son, Chris; his daughters Mary Ellen Chapman and Laurie Pinkney; and his nine grandchildren.

IN MEMORIAM

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

Andersen, E. Kenneth, Mining '61, in July 2014
Basaraba, Leonard George, Civil '67, in April 2014
Bulat, Gordon Andrew, Civil '65, in May 2014
Cook, Eric Henry, Mechanical '61, in March 2014
Davis, John Elwood, Civil '50, in June 2014
Doig, Russell Gibson, Civil '93, in April 2014
Engman, Alwon Sidney, Electrical '51, in April 2014
Fenniak, Lawrence Oliver, Electrical '55, in April 2014

Hughes, Ralph Elborne, Mineral Process '61, MSc (Petroleum) '63, in June 2014
Jacobs, Ted Frederick J., Electrical '53, in July 2014
Louis, Clifford Carl, Civil '59, in June 2014
MacQuarrie, Arnold Ellsworth, Civil '51, in May 2014
Mellsen, Stanley Brun, Mechanical '61, in February 2014
Montgomery, Walter Louis, Civil '49, in May 2014
Osinchuk, Vladymir, Chemical '57, in July 2014
Pinkney, H. F. Lloyd,

Engineering Physics '52, in May 2014
Plewes, Sheri-Lyn (Carlson), Civil '82, in July 2014
Shaw, Gregory Ridley, PhD (Electrical) '91, in May 2014
Six, Ivan M., Mining '43, in May 2014
Thompson, James Wilson, Mechanical '71, in June 2014
Veres, John, Electrical '50, in July 2014
Zakowski, James R., Chemical '69, in June 2014

The Faculty of Engineering was recently made aware of the passing of the following alumni more than a year ago:
Buckham, Alexander Fraser, Mining '35, MSc (Petroleum) '36, in 1981
Chmilar, John, Chemical '59, in 2002
Foucar, H. Gordon, Chemical '35, in 1992
Friesen, Fred H., Chemical '49, date unknown
Holden, Robert Douglas, Electrical '59, in November 2007
Luco, D. Ian, Mechanical '76, in November 2012
Macrae, Ian Anderson, Mechanical '74, in August 2013
McDermott, Stafford William, Mining '37, in 2004

McKoen, John Alexander, Civil '62, in November 2006
Morris, James Eugene, Mining '48, in October 2006
Noblitt, Harvey Leander, Mining '41, in 1989
Parry, Norman Allan, Electrical '50, date unknown
Price, Lynn Shapley, Chemical '50, in January 2013
Richards, Beresford Roberts, Mining '39, in 1982
Romanchuk, Steve, Chemical '50, in December 2011
Weston, Norman Owen, Electrical '35, in 2004
Williamson, John, Civil '62, MSc (Civil) '73, in January 2004
Wilson, Carl Robert, MSc (Civil) '67, in May 2010
Zowtiak, John, Electrical '50, in March 1997

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MYTH:
Graduate school is a questionable financial decision.

REALITY:
A graduate degree is a building block for a rewarding technical career.



DISPELLING MYTHS ABOUT GRADUATE STUDIES IN ENGINEERING

Graduate school is an investment in your future that can change the trajectory of your career, opening doors to exciting challenges, and increasing your earning potential. An advanced degree in engineering can be the first step on a career path to leadership positions in industry, government and academia.

This fall, Canada's top engineering schools are joining forces as the Canadian Graduate Engineering Consortium to promote the value of graduate programs in engineering. You are invited to learn more and meet the schools in Edmonton on the evening of September 30. For details visit: www.engineering.ualberta.ca/NoMyths.

Can't attend? Explore the possibilities of postgraduate engineering education at www.engineering.ualberta.ca/GraduateResearchExcellence.