

WEAL

WATERLOO | **ENGINEERING** alumni letter

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UNIVERSITY OF
WATERLOO

WEAL

Waterloo Engineering
Alumni Letter

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Waterloo Engineering's Women in Engineering committee has been helping empower young girls and women for 25 years.



Happy 60th anniversary everyone! What an incredible journey the past six decades has been. Who could have imagined that 74 young men beginning engineering programs in a pair of tin-roofed portables on July 1, 1957 would be the foundation of what is today a world-leading university in research and experiential education.

As we move into the next decade, we reflect on our remarkable past. The historical timeline in this issue highlights many of our milestones along the way. It's fun to look back at where we started and think about where we are now.

One of the biggest differences is that the original class of 74 has grown to 7,630 engineering undergraduates enrolled this past year with women comprising 25 per cent of all undergraduates and 29 per cent of our first-year students. And for the first time in the history of the Faculty, there is double-digit female enrolment in the first year of all our 14 undergraduate programs.

The number of women has steadily increased in large part due to the dedicated efforts of our Women in Engineering (WIE) committee. Celebrating its 25th anniversary this year, the committee provides support to current female engineers and university students, while encouraging the next generation of women to pursue careers in engineering.

Mary Wells, the Faculty's associate dean of outreach, talks in this edition about the secret of attracting women to the engineering profession. Mary's exceptional work as chair of our WiE committee, as well as the Province of Ontario's WiE committee, was recently recognized with the 2017 Engineers Canada Award for Support of Women in Engineering and Engineering Excellence.

During the past six decades, our engineering programs have drawn people from around the world, many of whom have encouraged their children, grandchildren, siblings and even friends of siblings to become Waterloo Engineers. Doug Wright, our first dean of engineering, and others take a look at family connections and classmate friendships that have stood the test of time.

The term "artificial intelligence" was coined in 1956, just a year before the launch of our Faculty. Today, AI is part of everyone's lives in some form or another. Waterloo Engineering researchers are at the forefront of developing advancements in a branch of AI they call "operational AI." Leaner, smaller, less expensive and more accessible are just some of the words our experts use to describe their AI work. WEAL's cover story takes a look at the technology they are pursuing in fields including medicine, robotics, self-driving vehicles, speech recognition and living architecture.

If you've been on campus lately, you'll have seen Engineering 7 under full construction. This seven-storey building, a major initiative of our Educating the Engineer of the Future campaign, will house our Engineering Ideas Clinic, seven lecture theatres, the second C&D shop, student study and meeting spaces, and feature dedicated space for our rapidly growing entrepreneurship and research programs. Included in this WEAL are an update on our campaign and ways you can consider contributing to help uniquely educate our students.

As we continue our 60th celebrations this year, I'd like to take the opportunity to let you know how proud I am to be part of Waterloo Engineering and to thank you for your support of this extraordinary Faculty. I can't wait to see how we'll continue to make our mark in Canada and right around the world throughout the next 60 years.

Sincerely,

A handwritten signature in black ink that reads "Pearl Sullivan".

PEARL SULLIVAN
Dean, Faculty of Engineering

Professors honoured for exceptional teaching

Sherman Shen received the designation of University Professor this past spring. Shen is the first member of the electrical and computer engineering department to be recognized with this prestigious University of Waterloo distinction, which recognizes exceptional scholarly achievement and international pre-eminence.

Other engineering faculty members who have the title of University Professor are Keith Hipel of systems design engineering, Flora Ng and Garry Rempel of chemical engineering, and Robert Jan van Pelt of the School of Architecture.

At spring convocation, two professors were recognized for their exceptional work in the classroom.

Sanjeev Bedi, a mechanical and mechatronics engineering professor, and Dan Davison, an electrical and computer engineering professor, were recipients of the Distinguished Teaching Award. They were two of four campus-wide to receive the University's most prestigious teaching honour.

Gordon Stuble, a mechanical engineering professor who has been teaching in the Faculty of Engineering for 30 years, was recognized with a 2017 3M National Teaching Fellowship, awarded by the Society for Teaching and Learning in Higher Education and 3M Canada. Up to 10 people from across the country are presented annually with the fellowship, considered Canada's most prestigious award for excellence in post-secondary education.

Stuble is described in his award citation as having a transformative impact on the University of Waterloo through changing the culture around teaching, acting as a guide committed to making teaching count and helping his colleagues and his students succeed.

Finalist for autonomous vehicle competition

The University of Waterloo is one of eight finalists in a North America-wide competition for undergraduate students to develop autonomous passenger vehicles over three years.

Launched by the Society of Automotive and Aerospace Engineers (SAE) International and sponsored by General Motors, the AutoDrive Challenge will involve work by student teams on donated Chevrolet Bolt EV cars starting this fall. Waterloo is one of only two Canadian universities selected for the competition.

First-hand experience

The goal of the competition is for teams to navigate an urban course in automated driving mode after progressively modifying their cars using sensing technologies, computing platforms, software design implementation and advanced computational methods.

"Student competitions such as the AutoDrive Challenge allow our undergraduate students to gain first-hand experience while learning from industry leaders like GM Canada," said Derek Rayside, an electrical and computer engineering professor.

Both Rayside and William Melek, a mechanical and mechatronics engineering professor, are faculty advisors for the competition.

Rick Mercer meets Autonomoose

In March, Rick Mercer made stops at Engineering 5 and a local test track for a light-hearted look at aerial drones and autonomous vehicles in a segment that aired on the CBC's Rick Mercer Report.



Mercer opened the six-minute piece by describing Waterloo as a “hotbed of high-tech innovation” and the University of Waterloo as the place “where the tech leaders of tomorrow come to plan not only their future, but ours as well.”

Mechanical and mechatronics engineering professor Steve Waslander and several students played along as the comedian delivered a bucket of chicken via a drone. He then travelled in and ran beside a slow-moving Autonomoose, the automated car approved for testing on Ontario roads by a team of University researchers.

Launch of part-time MBET

The Conrad Business, Entrepreneurship and Technology Centre has introduced a part-time version of its Master of Business, Entrepreneurship and Technology (MBET) program, designed for individuals who want to develop the skills to lead change and launch new ideas while balancing full-time work. Course material will be delivered in weekend sessions over three years, with the first cohort starting classes this September.

The MBET program is a graduate business degree for entrepreneurs that combines interdisciplinary courses with practical experiences in venture creation and commercialization. The new part-time program's weekend format offers greater flexibility for students to develop their entrepreneurial skills with the mentorship of acclaimed faculty and industry leaders, while applying learning to their workplace or venture in real time.

Funding boost for amphibious houses project

Elizabeth English, a School of Architecture professor, has been awarded funding to further develop low-cost amphibious houses used in flood-prone areas throughout the world.

Her project was selected as one of 12 that will share a \$10 million (U.S.) competition pool to tackle flooding in some of the world's most vulnerable communities.

The Water Window Challenge, sponsored by the Global Resilience Partnership and Z Zurich Foundation of Zurich Insurance, awarded funding to teams offering innovative solutions to issues affecting flood-prone communities in the Horn of Africa and South and Southeast Asia.

English and her team will pilot the amphibious houses currently used in areas of Louisiana by adapting the design for the local communities in the Mekong Delta.

Additionally, English's amphibious foundations project was recently awarded \$500,000 from the National Research Council.

Educating the Engineer of the Future update

Funding for the construction of the \$88-million Engineering 7 building received a boost in January 2017 with the announcement that the federal government is providing \$32.6 million from its Post-Secondary Institutions Strategic Investment Fund for the state-of-the-art building. Now, Waterloo Engineering is hard at work continuing to raise the final \$8 million required for the building.

Special focus will be on the Engineering Ideas Clinic, a pivotal student learning space in Engineering 7. The two-floor clinic will allow professors from different engineering disciplines to collectively teach theoretical concepts through experiential, hands-on learning. Waterloo Engineering's undergraduate students will use the facility to tackle progressively difficult challenges throughout their education.

Enormous impact

“The Engineering Ideas Clinic has struck a chord with alumni and industry supporters,” says Sanjeev Bedi, a mechanical engineering professor and director of the Engineering Ideas Clinic. “They immediately recognize that this model of real-world teaching has never been done before — we're connecting the digital and physical worlds, using the deep engineering knowledge for which our curriculum is known. Support for the construction of Engineering 7 and the Engineering Ideas Clinic will have an enormous impact on the innovation landscape in the Region of Waterloo and across the country.”

Alumni wishing to donate to the Engineering Ideas Clinic and be recognized in the space may choose from various funding levels:

- » Team Member: \$10,000–\$49,999
- » Maker: \$50,000–\$99,999
- » Builder: \$100,000–\$249,999
- » Founder: \$250,000+

Those who would like to donate can contact Nenone Donaldson, director of advancement, at ndonaldson@uwaterloo.ca

A | Nav Ganti, a member of the Autonomoose team, accompanies Rick Mercer, right, in the driverless car.

B | Elizabeth English has been awarded funding to build an amphibious house that can rise with floodwaters in some of the world's most vulnerable communities.

AI with a difference

More intelligent, accessible and affordable

Chaojie Ou (left), a doctoral candidate, and Fakhri Karray, director of the Centre for Pattern Analysis and Machine Intelligence, work together developing AI technology for driver behavior recognition and human-car cognitive score assessment.



Alexander Wong is explaining the concept at the core of his groundbreaking artificial intelligence (AI) research when he realizes a comparison would probably help.

But it isn't in computer science or computer engineering that the Waterloo systems design engineering professor and alumnus finds a useful analogy to convey how the process of progressively compacting expansive deep neural networks to fit on small computer chips basically works.

His practical example is the Mexican blind cavefish, which has endured over time in a dark, underground environment by gradually shedding both its eyes and the area of the brain that normally controls vision.

With food and oxygen in short supply, scientists theorize, the blind, colourless fish has adapted by sacrificing a sense that was of limited use to gain crucial energy savings of about 15 per cent.

"That's what it needed to survive," says Wong, impressed by the efficiency of the evolutionary forces involved.

Similar forces are at work in "evolutionary deep intelligence," one of many promising areas of AI that Waterloo Engineering researchers are pursuing in fields including medicine, robotics, self-driving vehicles, speech recognition and living architecture.

In effect, Wong and doctoral student Mohammad Javad Shafiee discovered that large deep neural networks — powerful programs with layers and layers of processing units at the heart of the most prominent kind of AI — will find efficiencies and shrink themselves when denied resources in their numerical environments.

Done repeatedly, generation after generation, they have used the process to produce deep neural networks over 100 times smaller than their originals while maintaining similar performance for particular functions.

The results are compressed deep neural networks — essentially complex computer programs designed to mimic the workings of neurons and synapses in the human brain — able to fit on computer chips the size of a coin or smaller.

Significantly, those chips can then be built right into devices and machines rather than requiring connections to enormous cloud-based computing power to provide their intelligence.

"There are certain tasks for which the 'brain' they create, this large AI, is overkill," says Wong, who co-directs the Vision and Image Processing (VIP) Lab and is a Canada Research Chair in medical imaging systems. "There are many places where we can slim down, so to speak."

Leaner. Smaller. Less expensive. More accessible.

Those are the goals pursued by Wong and numerous colleagues across multiple disciplines within Waterloo Engineering, plus key collaborators from computer science, in a branch of AI they call "operational AI."

AI for the masses

The keys to operational AI, as they were to the Mexican blind cavefish, are maximizing efficiency and minimizing required resources.

"It's application of AI for the masses, if you like," says Fakhri Karray, an electrical and computer engineering professor. "It should be available everywhere to almost everyone, giving access to as many people as possible."

Much of the current buzz about AI as technology that will dramatically change the world concerns the use of deep neural networks, or artificial neural networks, to achieve what is known as deep learning.

Technology giants including Google, Microsoft and Amazon are investing heavily in research to produce super-human performance by increasing the layers of algorithms and the computing power needed to process massive amounts of data.

Their efforts have yielded impressive results such as AlphaGo, a computer program that exceeded expectations and defeated a top professional last year at Go, a strategy board game that was invented in China over 2,500 years ago and is more complex than chess.

The federal Liberal government of Prime Minister Justin Trudeau, meanwhile, demonstrated its belief in the importance of AI to the future by committing \$125 million in its March 2017 budget to create a Pan-Canadian Artificial Intelligence Strategy.

Practical, evolutionary approach

Despite its awesome potential, however, experts say the use of this deep learning AI is limited in many situations by cost, computational complexity and other factors.

Operational AI, the practical approach taken at Waterloo Engineering to complement fundamental, foundational research in the field, is focused on overcoming those limitations by developing stand-alone systems tailored to specific applications.

William Melek, a professor and director of mechatronics engineering at Waterloo, says most small and mid-sized businesses, for instance, “see the promise” of AI, but are daunted by its imagined price tag and need for highly trained employees to operate it.

“They think it’s not affordable, not within their reach,” he says. “But with our approach, you democratize AI in a way that makes it accessible to everybody and affordable for everybody.”

Central to the solution for many forms of the technology is distilling AI down until what is needed to do the job can fit on a chip and be implanted, or embedded, within devices and machines, eliminating the need for a connection to powerful servers or cloud computing networks.

Other variations of operational AI still utilize the Internet for reasons including lower upfront costs and convenience, but do not require huge computational resources to efficiently perform their particular tasks.

The evolutionary approach taken by Wong achieves its goal by shrinking or compacting deep neural networks to their essential elements.

“Despite the fact we don’t have access to these giant clouds, we’re still able to produce artificial intelligence that performs similarly, just as well, or close to just as well, but with much more constrained operational requirements,” he says.

Ning Jiang, director of the Engineering Bionics Lab, and lab members work on a multi-function mind-control robotic hand for amputees. From left, Mei Lin Chen, Lin Yao, Manas Joshi, Jiang and Erik Lloyd. The technology is also depicted on the cover of this issue.

Solutions for medical challenges

At the Waterloo Engineering Bionics Lab, researchers led by Ning Jiang are using self-contained operational AI to tackle medical challenges involving Parkinson’s disease, stroke rehabilitation, autism, manipulation of artificial limbs and phantom pain for amputees via human-machine interface.

At the heart of the technology are algorithms — which Jiang helped develop while working in Germany before coming to Waterloo two years ago — capable of identifying and interpreting electrical signals in the brain picked up by electrodes on the scalp.

“We can detect that you want to move your toe, for example, even before the toe moves,” says Jiang, a systems design engineering professor and director of the Waterloo Engineering Bionics Lab.

To demonstrate how the software works, he writes an ‘A’ in the middle of a piece of paper to represent the signal of interest, then crumples it into a tight ball. The ‘A,’ of course, can’t be seen.

Jiang then uncrumples the paper and smooths it out as best he can. Although it is creased and crinkled, the ‘A’ is easy to spot and read.

In effect, he says, that’s what the algorithms do — smooth out a dense mass of data on brain activity so the signal of interest, such as the desire to wiggle a toe, can be pinpointed using relatively small computers.

Applications of that breakthrough now being pursued in his lab include an exoskeleton for Parkinson’s patients who freeze while walking. Brain signals would be detected, read and sent to a small computer, which would then activate the mechanical exoskeleton to start a step.



"I'm developing something to help people improve their independence," says Jan Lau, a second-year biomedical engineering student who is working on the project. "That's what really fires me."

Another application being developed is a mind-control robotic hand. Although there are several multi-function prosthetic hands currently on the market, the one Jiang's lab is working on involves a new direction on dexterous myoelectric control mimicking the neuromuscular system.

The goal is to develop algorithms and control strategies that would offer amputees intuitive control of the sophisticated prostheses providing them with greater autonomy and better quality of life.

Deeper AI technology

A second approach to operational AI at Waterloo utilizes powerful machine learning algorithms that are accessible on the cloud to process and mine knowledge from reams of data.

That knowledge can then be used in the design of smart devices and machines, directly equipping them with deeper AI technology.

As an example in this category, Karray cites a system to alert drivers in danger of falling asleep at the wheel based on the frequency of their blinking and other physical cues read by an in-car camera.

Accurately pinpointing the warning signs requires analysis of huge amounts of data via complex learning systems. Once it is known, however, software imparted with that knowledge need only be tailored, not built again from scratch, to intelligently execute a particular function.

By combining existing human-machine interaction technologies, cameras and alert mechanisms, in fact, several teams of graduating students developed such systems for their Capstone Design projects at Waterloo this year.

"This is operational AI," says Karray, who is also a University Research Chair and director of the Centre for Pattern Analysis and Machine Intelligence (CPAMI). "You don't need hundreds of scientists at Microsoft or Google to develop the biggest algorithm on earth. Simply impart the extracted knowledge into embedded devices and you are able to produce the smartest machine possible."

In addition to dramatically cutting costs and complexity, severing the connection to the cloud with built-in, self-contained AI systems also deals with concerns around reliability, security and confidentiality in several areas of application.

With its ongoing, advanced fundamental research complemented by such a wide variety of practical applications and deployments, Melek says Waterloo Engineering is well-positioned to stake a claim at the forefront of the AI revolution.

"We have it covered from one end of the spectrum to the other — end-to-end, as we like to call it," he says.

Other recent highlights of operational AI at Waterloo:

- » Development at CPAMI of a set of AI-based platforms that outperform standard keyword spotting techniques in the field of speech recognition. A spinoff company, Cognitive Computing Technologies, is targeting commercial potential in the automotive, robotic, office and home appliance markets. CPAMI's founders and core members have also won national and international awards in operational AI and pattern recognition, as well as collectively producing more than 120 U.S. patents in those fields.



A | Jan Lau, a second-year biomedical engineering student, is designing a modular exoskeleton to help people with Parkinson's disease who freeze when walking.

B | Alexander Wong, Canada Research Chair and co-director of the Vision and Image Processing (VIP) Lab, along with his graduate students and VIP lab members, are teaching computers to interpret images and video through evolutionary deep learning. The technology will be used for many purposes, including assisting the visually impaired and autonomous driving. From left, Francis Li, Brendan Chwyl, Audrey Chung and Wong.



AI spinoff offers environmental protection

Highlights continued ...

- » A three-year collaboration between Clearpath Robotics, a company founded in 2009 by Waterloo Engineering students, and the Adaptive Systems and Autonomous Vehicles labs at Waterloo will focus on communications between staff members and autonomous warehouse robots without the need for expert programming and supervision.
- » A lead role for an experimental research team headed by School of Architecture professor Philip Beesley that is pursuing a futuristic vision of living, breathing buildings. Backed by \$2.5 million in federal funding and including over 40 collaborators in North America, Europe and Asia, the effort is looking 20 years out to the potential for architecture that anticipates and responds to the needs of its human occupants.
- » International honours for a VIP Lab team at a Neural Information Processing Systems conference for a paper that topped other leading research institutions in the area of efficient methods for deep neural networks. A spinoff company, Darwin AI, is targeting potential application areas in a wide range of markets.
- » Ongoing construction of RoboHub, a \$4.5-million testing facility for autonomous ground, aerial, humanoid and magnetically levitated robots in the new Engineering 7 building set to be completed in 2018. The only facility of its kind in the world, it will be used for a variety of research into robot coordination and autonomy.

Mohamad Vedut, left, Mariam Javed and Thouheed Abdul Gaffoor are part of EMAGIN, a startup that has developed artificial intelligence to help manage water systems.

Mariam Javed is finding a receptive audience for a new system that uses operational artificial intelligence (AI) to help municipal utilities proactively improve their water and wastewater operations.

As vice president of business development for EMAGIN Clean Technologies Inc., a startup co-founded by a Waterloo Engineering graduate student, she can tout both cost savings and environmental protection.

"When we tell them what we can provide, they're excited to learn more," says Javed, a civil engineering master's candidate. "A lot of these municipalities are really forward-thinking, so they're ready to implement these new technologies."

EMAGIN uses operational AI software to analyze and "learn" from data that is already collected by water utilities via sensors. Based on what happened in the past, the system can predict what will happen in the future and make recommendations to maximize efficiency.

If they accurately know what water demand will be at a given time, for instance, utilities can prepare for it by pumping when electricity rates are at their lowest, generating savings in the process.

"They collect this data, but they don't ever use it," says Thouheed Abdul Gaffoor, who co-founded the company in early 2016 based on his co-op experiences and civil engineering master's research at Waterloo. "That's why this is the next logical step for utilities in terms of technology."

After winning a coveted spot at a Silicon Valley accelerator for startups in the water sector and, most recently, \$25,000 in the Velocity Fund Finals at Waterloo, the company is just gathering steam.

In addition to pilot projects for its low-overhead, Internet-based subscription service at utilities in Ontario, California and the Middle East, EMAGIN is negotiating a round of seed funding from private investors.

One of many Waterloo spinoffs poised to contribute to the coming AI revolution, it also has plans to grow beyond the Velocity Garage in downtown Kitchener with satellite locations in Ontario and the San Francisco area.

"It's been pretty fast-paced, but we're loving it," says Gaffoor.



Changing face of engineering

WiE committee marks 25th anniversary

When Derek Wright walked into the RCH lecture hall as a first-year Waterloo Engineering student in 1998, something was missing: estrogen. Males made up fully 90 per cent of his electrical and computer engineering program.

“In high school, most of the people in physics, math and chemistry with the high marks were women,” he recalls. “I remember thinking, ‘What happened to them? Where did they go?’”

Today, that picture has changed significantly. In 2016, women made up 29 per cent of Waterloo Engineering’s incoming class. And for that, you can thank Waterloo’s Women in Engineering (WiE) committee. For 25 years, it has been working to attract women to the engineering profession — and succeeding.

According to Mary Wells, engineering’s associate dean, outreach, and chair of the WiE committee, part of the secret is engaging girls in the junior grades and encouraging them to study math and physics.

“All the research shows that early engagement is crucial,” she says.

Equally crucial is changing perceptions about what engineers do. Yes, some build fast cars or shoot rockets into space. But others work on providing clean drinking water, creating life-saving medical technology and developing sustainable ways to power the world — exactly the kind of human-focused challenges girls gravitate toward.

WiE’s roots

Beth Weckman became involved in WiE and STEM (science, technology, engineering and mathematics) activities when she was a Waterloo undergraduate and graduate mechanical engineering student during the 1980s. When she started her doctorate, there was a core group of interested female graduate students who met on a regular basis to discuss issues in common.

In 1987, Weckman became the chair of the Career Guidance Committee for the Kitchener-Waterloo Chapter of Women in Science and Engineering (WISE) that included representatives from both the University of Waterloo and Wilfrid Laurier University.

“The group of dedicated students, faculty, and community representatives had a common goal to encourage more young women in this area to consider entering the non-traditional areas,” recalls Weckman.

At the same time, she was involved in several campus initiatives that related to equal rights, which were then mainly focused on gender equality. She was also the graduate student representative on the President’s Advisory Committee on Equal Rights.

When Weckman became a Waterloo Engineering faculty member in 1989, she and a number of others continued their involvement in WiE-based activities with the encouragement and support of Bill Lennox, who was then dean of engineering.

“At the same time, there were many initiatives across campus to increase the participation, visibility and acceptance of women in faculty positions and to encourage a more welcoming climate,” says Weckman. “These meshed extremely well with what we were doing in engineering.”

The WiE committee, which has always included both men and women, was formalized in 1992 to consolidate, solidify and garner formal recognition for all of the activities that were going on across the Faculty and the University to support women.

Weckman started as a member of the WiE committee and in 1993 became co-chair, a position she held for a number of years. Some of the WiE committee’s early activities included working with the University’s ad-hoc Committee on Harassment, which resulted in the implementation of a zero-tolerance policy in engineering.

“Various initiatives went in and out over the years and many had to be restarted at various times,” she says. “That is why it was great when a more formal structure was put into place to have dedicated support.”

Inspirational programs

Today, WiE runs a slew of outreach programs targeting girls in elementary and high school, reaching more than 1,500 each year. Programs include girls’ clubs, Go ENG Girl events, conferences, learn-to-code days and even opportunities for Girl Guides to earn their Engineering Skills Badge.

Mariko Shimoda is one of the participants those programs inspired. As a Grade 11 student attending WiE’s annual Catalyst Conference, she dissected an engine, used drill presses, and designed bridges and pulley systems.

“That was when I decided okay, engineering is what I want to do,” says Shimoda, now a second-year student in mechanical engineering and a member of the engineering student ambassador team.

However, simply recruiting more women won’t solve the current gender imbalance. Wells also points out the need to create a Waterloo Engineering culture where female students can thrive.

Retaining more women also means addressing a lack of confidence among young women. According to a survey conducted in the last five years, female students in first year of Waterloo Engineering rated their math ability below their classmates.

“For most guys, society tells them they’re good at math and good at science. They’re told they can make things and that they can be engineers,” Shimoda explains. “But it’s not really something girls are told very often.”

A | WiE provides opportunities for Girl Guides to earn their Engineering Skills Badge.

B | Mary Wells, WiE committee chair and Pearl Sullivan, dean of engineering, second and third from right, in the front row, take part in a WiE event.



C | Engineering student and WiE volunteer Mariko Shimoda, right, chats with Sasha Hall, project manager for the Waterloo Submarine Racing Team.

To boost confidence, WiE pairs incoming female students with upper-year mentors who can guide them through the challenges of first year. In addition, a new living-learning community in St. Paul's residence at the University offers female engineering students peer support.

Another challenge is that women tend to arrive with less practical, hands-on knowledge than their male classmates. On Shimoda's first day of orientation, for example, she remembers overhearing two male classmates talking about their favourite kinds of engines. She panicked.

"Was this the wrong program for me?" she asked herself. "I can't name engines off by heart."

It's concerns like Shimoda's that prompted WiE to offer female-only workshops designed to enhance technical skills in a judgment-free environment.

Foundation for career success

The program also extends to career preparation, providing negotiation workshops and running mock job interviews to give female students the skills, confidence and social capital they need to succeed in what is still a male-dominated field.

That's crucial, because many workplaces lag behind universities when it comes to fostering inclusivity. As a result, female graduates drop out of the profession in greater numbers than their male colleagues, citing working conditions and workplace culture.

Wells believes the next step involves engaging men as allies in promoting diversity. She points to the prevalent perception among male students that if a female classmate lands a prestigious co-op job, it's because she was a "diversity hire."

"We need to have an honest conversation about that," Wells says.



Wright, now a Waterloo Engineering professor, is one of the men who has stepped up.

As head of electrical and computer engineering's continual improvement program, he's working to ensure the department welcomes all students and gives them a sense of belonging. Wright, whose wife is a fellow electrical and computer engineering grad, understands that a more diverse workplace leads to more creative ideas and better decisions — and that if bright young women discount engineering as a potential career, the profession loses out on a significant source of talent.

For Wright, however, the biggest motivation is ensuring his five-year-old daughter doesn't limit her career choices when she grows up.

"I'm confident that it will change," he says. "I think the outlook is positive."

Wells agrees. Today, with females making up nearly 30 per cent of the first-year class, there is a critical mass that is naturally changing the classroom dynamic and the curriculum.

As chair of the Ontario Network of Women in Engineering (ONWiE), Wells is also instrumental in helping women engineers across the province achieve their goals. And her hard work has been recognized. She was recently awarded the Engineers Canada Award for Support of Women in Engineering and Engineering Excellence for her work at Waterloo and with ONWiE.

Paying it forward

Shimoda says she has benefited greatly from upper-year women mentors and teaching assistants. As an active member of WiE, she's paying that support forward to other female students, whether they're signing up for high-school physics, stepping into a Waterloo Engineering lecture hall for the first time or getting ready for a job interview.

"I get a lot of strength from encouraging other people," says Shimoda. "I think it's really, really nice to empower younger girls and encourage them to study engineering."

D | Derek Wright, electrical and computer engineering professor, with some of the winners of the ECE Design Days event, at which first-year students attempt to solve various technical challenges.

Women giving back

The alumni featured here are three of thousands around the world making a difference by supporting and mentoring young girls and women.

Breaking the perception ‘that tech is for boys’

Sara Haider (BSE '08, Software Engineering) should have hit the ground running when she started Waterloo's software engineering program in 2003.

She had already been writing computer code for years after teaching herself the basics with her older sister so they could build fan websites about Star Trek and the Backstreet Boys.

It didn't work out that way, however, after Haider found herself as one of only a dozen young women in a class of 130.

Despite her skills and love of programming, she constantly questioned whether she belonged and struggled academically before gaining confidence and hitting her stride about halfway through the program.

“It threw me on the inside, but on the outside I didn't want anyone to know that, so I just pretended it didn't matter,” she says of the gender disparity.

Haider is now director of software engineering at Periscope, the live video streaming platform for Twitter, with a staff of 20 working under her in San Francisco.

Her experience as an undergraduate, meanwhile, helps motivate her volunteer work with Girls Who Code, a non-profit organization that introduces high school girls to software development in immersive summer programs at technology companies.

Haider was “terrified” when she approached the CEO at Twitter for funding to establish the program there in 2012, but negotiated for months to make it happen anyway.

Now she sits on the advisory board and gives guest lectures every summer, serving as a role model to encourage girls to pursue careers in STEM (science, technology, engineering and mathematics) areas.

“There is a stigma, a perception, that tech is for boys and we have to break that,” Haider says. “I've found a lot of success in this field and I want other women to know there are options for them.”

Harnessing the power of networking

Back in May 2016, Shahd Attar (MBET '06) started her first day of work as head of a female consumer department. As it turned out, it was a day of many firsts.



A

A | From introducing high school girls to software development, to co-founding a network of professional women in Saudi Arabia and launching a Girls in Engineering program at Berkeley, alumni are helping empower others around the world.



B

Her new employer was Saudi Telecommunication Co. (STC), an immense Saudi Arabian corporation with more than 17,000 employees. Attar became the company's first female ever to be hired.

"In the IT world, if you walk into a meeting and you're the only woman there, it is difficult. Imagine walking into a whole building or the whole complex!" she says now.

Since then, STC has hired roughly 30 women and has plans to hire a total of 100 by the end of 2017.

Attar has long been at the forefront of a changing society in the Middle East, which is slowly opening doors to working women in IT and beyond. She's the co-founder of Cella, a non-profit network of professional women in Saudi Arabia launched in 2011 with 70 members. Today, membership is more than 3,000 across the three main cities in Saudi Arabia.

Attar says her time as a Master of Business, Entrepreneurship and Technology student in Canada attending Communitech events helped her realize the power of networking. Yet, although she still adopts many customary Canadian practices — Cella events don't provide tables and chairs, thereby forcing members to stand and mingle — there's one she shuns to this day: the crack of dawn breakfast meeting.

"It was unusual to me that Canadians would be up in the morning feeling social at 7 a.m.," she says, laughing. "Here, our networking group starts at 7 p.m., which works better for us."



C



D

Reaching girls at a young age

What do battery origami bugs, big data and cow bones have in common? They're all carefully explored at a girls' engineering summer camp in the San Francisco Bay area.

The week-long camp, called Girls in Engineering, is hosted at the University of California, Berkeley, and inspires middle-school girls to investigate careers in the STEM fields.

The program was launched in 2014 by Claire Tomlin (BASC '92, Electrical), an electrical and computer engineering professor at Berkeley, where she holds the Charles A. Desoer Chair in Engineering. She developed the program after receiving funding for opt-in outreach for high school students.

It was time to reach girls much earlier.

"When girls are 10 years old, they're really enthusiastic and noisy, and they put their hands up to contribute," says Tomlin, a recipient of the MacArthur Foundation Fellowship. "As girls get older, they're a little more cautious."

Avoiding technical careers can have a detrimental long-term effect on income and career prospects for women. According to Statistics Canada, 24.4 per cent of the people employed in professional scientific occupations in 2015 were women, while 75.6 per cent were men.

Tomlin is the first to admit that watching her mother work hard after her parents' divorce spurred her to find a well-paying career that incorporated her love of math, science and problem solving. Today, her research focuses on applications, unmanned aerial vehicles, air traffic control and modelling biological processes.

"I do things in my career now that I loved doing when I was in high school," she says. "I want middle-school girls to be inspired too."

B | Sara Haider, BSE '08, Software Engineering

C | Shahd Attar, MBET '06

D | Claire Tomlin, BASc '92, Electrical Engineering

Engineering family ties

Fellowship of the iron ring

When members of the Wright family sat down to talk about their time at Waterloo Engineering, Gregory opened the conversation by saying that he thought his grandfather originally wanted to become a doctor.

"No, it was *my mother* who wanted me to become a doctor," said Doug Wright to laughter from his family. "I always wanted to be an engineer who built things."

And he did just that.

Doug studied civil engineering at the University of Toronto, the University of Illinois and the University of Cambridge, where he received his doctorate in 1954.

After working for a few years at Queen's University, Doug joined Waterloo in 1958, the year after the University opened its doors. He started as the first chairman of civil engineering, and soon after became the first dean of engineering. At just 31, he was the youngest dean of engineering in the country.

During his time as dean ending in 1966, he established Waterloo as a leading engineering school with Canada's largest undergraduate enrolment. Doug later became president and vice-chancellor of the University of Waterloo, a position he held from 1981 to 1993.

All of Doug's five children came to the University of Waterloo as students. Two of them, son Bill and daughter Anna (Wright) Scott, majored in systems design engineering.

Anna remembers that she liked math and science in high school and knew that being an engineer would equip her to learn and problem solve — both important career skills.

Doug Wright was the first dean of engineering from 1958 to 1966.

"Having a father and my oldest brother as engineers cinched the decision," says Anna, who graduated in 1987 and worked as a software engineer for 15 years.

Anna wryly noted that she didn't consider it an asset to have her father as the president of the University while she was a student during the 1980s.

"I didn't really think many people would figure this out, but during my first week a professor asked me my last name in front of the whole class and then asked if Doug Wright was my father. My cover was blown," she jokes. "After this, though, things settled down very quickly and I was just another student."

Anna's brother Bill had earned his undergraduate degree and was nearly finished his master's in systems design engineering when his father returned to the University as president.

"For me, it was more a matter of being aware my dad had shaped this school with its values and disciplines," says Bill, a software research and product engineer and founding partner at Uncharted Software. "I think it made me closer to my dad when I was living his conception. And it opened my eyes to just how much it is possible to achieve."

Anna's daughters Samantha and Abbey followed the lead of their mother and came to Waterloo for systems design engineering. Samantha graduated in 2015 and is now a product manager at Etsy in New York City. Abbey is in her final work term, and is expected to graduate in 2018.



60 years ago in Canada

- » Montreal Canadiens win the Stanley Cup
- » *Diana* by Ottawa-born singer Paul Anka is released
- » John Diefenbaker succeeds Louis St. Laurent as prime minister of Canada
- » Canadian Foreign Minister Lester B. Pearson wins the Nobel Peace Prize
- » Thanksgiving is moved to its current date, the second Monday in October
- » The price of the average Canadian house is \$20,000

On July 1, 1957

- » Across Canada the country celebrates Dominion Day and its 90th anniversary
- » In Waterloo, Ontario 74 young men in engineering classes launch what will become the University of Waterloo two years later



60 years

of historic milestones

JULY 1, 1957

- » Waterloo College Associate Faculties (incorporated as University of Waterloo in 1959) founds with chemical, civil, electrical and mechanical engineering, and the engineering physics program. An entire term's textbooks cost \$54.29.
- » In October, students begin their initial work term as the first co-op education program launches in Canada.



1958

- » The Great Water Tower Caper takes place when the word BEER is painted on Waterloo's water tower — 125 feet above the ground. This marks Waterloo's first nationwide publicity. Four years later, a replica of the tower built by engineering students is part of a local parade.



Photo courtesy of Nick Ciolfi (Mech '64, '76)

1961

- » Engineering 2 and Engineering 3 buildings are constructed.

1962

» The first engineering degrees are awarded.



1964

» Engineering enrolment tops 550 students, the largest in Canada. Co-op grows to include more than 400 Canadian corporations and organizations in six provinces.



1965

» The management and systems design engineering (MAsc and PhD) program launches and the engineering physics program ends.

1966

» The management sciences program launches (formerly management and systems design engineering).

1967

» The Engineering Lecture Hall is built. It is later renamed J.R. Coutts Engineering Lecture Hall in honour of Rod Coutts, an electrical engineering alumnus.
» Waterloo's professional architecture program launches.

1968

» Engineering Society's mascot, 'The Ridgid Tool', makes its first public appearance at a semi-formal dance.



1969

» The systems design engineering program and environmental studies division launch.

1970

» Throughout the 1970s, the admissions average of Waterloo Engineering students increases to 81%, with half having averages in excess of 90%.

1971

» Engineering 4 is built. It is later renamed CarIA. Pollock Hall to honour a university founder and chancellor.

1972

» Intellectual property policy is introduced.

1977

» Starting this year, during most winter terms engineering students raise money for a local charity through an event known as Bus Push. Over the years, the "push" has evolved into a "pull" with a thick rope attached to the bus.



1978

» The Waterloo Pump is designed in Waterloo Engineering to help developing nations bring clean water to communities. It's still in use today.

1979

» The School of Architecture opens its studio in Rome, Italy.

1980

» Waterloo Engineering has 200 women and 3,000 men enrolled.



1982

» The geological engineering program is introduced.

1984

» The computer engineering program launches.



1990

» First Midnight Sun solar car is unveiled by engineering students at a cost of \$116,000.
» Waterloo Engineering Endowment Foundation (WEEF) is founded by undergraduate students to benefit undergraduate engineering education. Now over \$14 million, it is the largest student-run endowment fund in Canada.
» Engineering Science Quest summer camps launch.

1998

» Civil engineering's Artic Fire team captures first place in the 1998 Great Northern Toboggan Race.

1999

» With its genesis in Waterloo Engineering, the first BlackBerry phone hits the market.

2000

» Engineers Without Borders Canada, an international development organization, is started by two engineering graduates.
» The environmental engineering program launches.

2001

» The software engineering program launches.

2003

» The mechatronics engineering program launches and the Centre for Environmental and Information Technology is constructed.

2004

» Midnight Sun VII sets a Guinness World Record for the "longest journey by a solar electric vehicle" by travelling 15,070 km through Canada and the United States.

2005

» The nanotechnology engineering program launches.
» The School of Architecture, part of Waterloo Engineering for its first two years (1967-69), returns to its roots after 36 years in Environmental Studies.



» University of Waterloo's Alternative Fuels Team — the only Canadian team participating — triumphs over 16 top U.S. universities to win first place at the Challenge X competition.



2007

» The University's Centre for Business, Entrepreneurship and Technology joins Waterloo Engineering — four years later, "Conrad" is added to its name.
» The mechanical engineering department is renamed mechanical and mechatronics engineering.
» Management engineering launches.

2010

» Engineering 5, home to mechanical and mechatronics engineering, systems design engineering, and electrical and computer engineering, opens. Features include two-storey, 20,000-square-foot student design centre, now known as the Sedra Student Design Centre.



2011

» Engineering 6, the new home for chemical engineering, opens.

2012

» Stephen Hawking helps open the Mike & Ophelia Lazaridis Quantum-Nano Centre, which houses the nanotechnology engineering program and the University's Institute for Quantum Computing.
» The Centre for Bioengineering and Biotechnology launches.

2014

» The biomedical engineering program launches.
» Waterloo Engineering awards the most engineering doctoral degrees (125) in Canada.

2015

» Two engineering students develop an autonomous vehicle that becomes the very first to drive on a Canadian road.
» Construction begins on Engineering 7. The building, set to open in 2018, will house the Engineering Ideas Clinic™, a Multiscale Additive Manufacturing (3D Printing) laboratory and RoboHub, which will support testing of aerial, mobile and magnetically levitated robots. It will also accommodate the expansion of mechatronics engineering, biomedical engineering, and much more.



2017

» Waterloo Engineering celebrates its 60th anniversary on July 1. We're now over 9,500 students and almost 44,000 alumni strong!



The next 60

From cellphones to driverless cars, engineering has literally transformed our lives every day during the past 60 years. We asked an ESQ camper, an undergraduate student and a master's candidate to use their own crystal ball to answer in 100 words or less what they think Waterloo Engineers will develop or accomplish by 2077.

"I believe Waterloo Engineering will become a household name across the globe. A name that rivals that of Stanford and MIT, not because of the startups that emerge from Waterloo, but because of the problems we solve.

"Some might call these problems 'boring', but they're problems that make a difference. And although the solutions to these problems are what will continue to 'put us on the map', it's our approach and perspective that'll be recognized over the next 60 years because of the impact we'll have."

Phil Everson, fourth-year management engineering student

"In the future, learning will be done virtually instead of in classrooms, because students learn better experiencing things instead of sitting at a desk. We will explore virtual environments that let students find their own discoveries. I had fun at Waterloo's March Break Virtual Reality camp learning to create virtual environments myself!

"Waterloo Engineers will design amazing things like hovercrafts and jet packs for people to use for emergency rescues in skyscrapers, or to cross over to islands. They will preserve the environment by designing cars and homes that run on electricity from solar, wind, and battery power, not fossil fuels."

Sonia Snyder, Grade 7

"The future holds many challenges for Waterloo Engineers — from addressing underrepresentation of women in STEM programs to the growing changes in our natural environment, we have our hands full. However, we have continually proven to shift the paradigm and push the limits of innovation these last 60 years and thus, I have no doubt that we can do it.

"The future is bright, but we must seize all opportunities and all valuable knowledge we've gained as students of the University of Waterloo to address those hard questions."

Mariam Javed, civil engineering master's candidate



From left: Phil Everson, Sonia Snyder and Mariam Javed

continued from page 16 ...

Bill's son Gregory also chose Waterloo, and majored in chemical engineering. He subsequently completed his master's degree at the University of Toronto and is now working at Zeton in Burlington.

The Wright family agrees the Faculty's co-op program, which Doug was instrumental in helping develop and promote, is one of the main reasons why Waterloo's undergraduate engineering program is the largest in Canada and is recognized around the world.

Doug recalls that when co-op was first introduced, some critics thought that disrupting students' studies every four months to spend four months in the workforce would upset them. It turned out it had just the opposite effect. Students embraced the regular rotation from campus to work and back again.

"I loved the variety of it," says Anna. "There was a lot of energy around the co-op program and it was very exciting. The other thing I enjoyed about co-op was that something new was always just around the corner. I found it very exciting to be in this dynamic, fast-paced environment."

"It's a feeling you only get with other Waterloo Engineering students that nobody else really understands," adds Gregory.

Co-op makes the grade

Waterloo's co-op program was the drawing card for Shaman Seth when he was looking for a university to attend in the early 1980s.

"In addition, I was living in Toronto and wanted to have a university experience in a campus environment," says the 1988 mechanical engineering grad.

The campus environment turned out to be more than just a learning experience for Shaman, who now works as a financial advisor. While living in the University's Village 1, North One residence he met Marina, a Waterloo math and business student, who was a few doors away. After graduating and marrying in 1988, the couple moved to the Fergus/Elora area and joined the Elora Racquets Club where they played recreational squash and tennis.

Top marks in school and on the court

Shaman and Marina are now parents to five children—Micaala, Natasha, Cameron, Marisa and Ravi—who not only inherited their parents' love of racquet sports, but also for their alma mater. The couple's three daughters and two sons have all become Waterloo students, with the oldest, Micaala, and the youngest, Ravi, enrolling in Waterloo Engineering programs. Micaala graduated from chemical engineering in 2013 and works in the oil and gas industry in Sarnia, Ontario, while Ravi just completed his first year of mechatronics engineering.

Like their parents, the Seth children have excelled in the classroom and on the courts as well.

Micaala says that since squash was such a big part of her life growing up, it was important to be able to play the sport at the university she selected. When she came to campus in 2008, Waterloo didn't have a women's varsity squash team, so Micaala practised with the men's team. After Natasha became a Waterloo math and business student, the two Seths started the women's varsity squash team. Later, younger sister Marisa joined in on the action and is currently co-captain of the team.

"We reached as high as second in OUAs (Ontario University Athletics)," says Micaala. "It was a great atmosphere having my siblings on the team."

Both Micaala and Cameron won the Canadian University and College Squash Championships and represented the University of Waterloo and Canada at the World University and College Squash Championships in Australia and India, respectively. Micaala was the University of Waterloo Female Athlete of the Year in 2013 and Natasha and Cameron have each been recipients of the President's Outstanding Scholar Athlete award.

"Being part of the Waterloo Varsity Squash team has been a great opportunity for each of our children," says Marina, a supply teacher and office manager. "The team has provided a wonderful balance with their academic studies, lasting friendships and a passion for the sport."

Not including ESQ summer camps attended by a couple of their children, Shaman and Marina will have had a daughter or son as a Waterloo student for 13 consecutive years, from 2008, when Micaala started, until 2021, when Ravi is scheduled to graduate.

After her youngest completes his degree, Marina anticipates she and Shaman will feel both proud and appreciative that their sons and daughters have persevered through exceptional programs and graduated from an outstanding school.

“We might feel sentimental that one chapter of life has completed,” she says. “However, we cannot foresee a day when the University of Waterloo will not be in our lives somehow.”

Teachers who made a difference

For Kiran Dhaliwal, it was her Toronto high school physics and calculus teachers who instilled in her the discipline as well as the inspiration needed to pursue and succeed in engineering at university.

Her physics teacher brought his telescopes to school in the evening for planetary viewing events and her calculus teacher would drive down every year to Waterloo to help grade Descartes tests.

“He was the type of teacher who would track you down at your locker to make sure you’d sign up for the next Waterloo math contest,” recalls Kiran. “I was also a huge Star Trek TNG fan, so that definitely played a part in making me want to pursue some form of engineering.”

A | The Seth family celebrated Micaala’s graduation from chemical engineering in 2013. Twenty-five years after Shaman received his iron ring from Waterloo, he had the special honour of presenting Micaala with hers. From left: **Shaman, Marisa, Natasha, Micaala, Cameron, Marina and Ravi.**

B | Members of the Wright family came together this past winter to discuss their engineering experiences. From left: **Gregory, Bill and Doug Wright, Anna and Abbey Scott.**

She made up her mind to apply to Waterloo Engineering’s electrical and computer engineering program after the older brother of a school friend visited her Grade 11 Class. That visitor was Thiru Sinnathamby, a 2001 Waterloo electrical engineering graduate who is now the vice president of software engineering at NVIDIA, located in the San Francisco Bay Area.

“I was really impressed with how much he valued the real-world experience he got on his various co-op terms and how they also helped him pay for school,” says Kiran, a 2006 electrical engineering graduate.

Kiran’s two younger brothers, Lakhvir and Amar, chose to pursue engineering after positive STEM (science, technology, engineering and mathematics) high school experiences that were similar to their sister’s.

“I was heavily influenced by my siblings who had both already graduated from Waterloo Engineering,” says Amar who majored in computer engineering.



All three now work in the San Francisco Bay Area. After graduating from Waterloo and practising as an engineer for several years, Kiran enrolled in law school and is now a patent attorney. Lakhvir is a senior hardware engineer at Mimosa Networks and Amar is a software engineer at Square Inc., where he was offered full-time employment during his final Waterloo Engineering co-op term.

Kiran says her parents, who still live in Toronto, are proud to have three Waterloo Engineers in the family and have continued to donate to the Faculty as a sign of their continued appreciation for the University.

"They've always wanted us to be able to pursue our dreams, and be successful professionally," says Lakhvir. "Having grown up with relatively modest roots, I feel it gives our parents peace of mind to know that our degrees from Waterloo help enable us to have the success and opportunities that they've always wished for us."

Kiran says her parents kid around once in a while that they're "disappointed" none of the three became a doctor.

"One of us might have to go back to school someday to get a PhD in engineering and put that joke to rest," she laughs.

Forging lasting bonds

Kiran says that from day one at Waterloo Engineering she felt an affinity with her classmates who had a common goal.

"I still remember Professor Gorbet told us in our very first lecture to each look to our left and then to our right. He pointed out that both of those people would be graduating along with you in five years," she says. "It was completely the opposite of the stereotypical first-year intimidation speech of telling students that only one of the three of you will make it."

For Lakhvir, his engineering connections began during Frosh week orientation and residence life, evolving into meaningful friendships that still endure.

Collective spirit

Experiencing a strong sense of community starting with the first day on campus is something the Dhaliwal, Seth and Wright/Scott families have in common.

Soon after beginning school, Shaman Seth and the rest of his mechanical engineering class voted on the name Batmech — a takeoff on Batman — to represent their collective spirit.

"We stayed very close as students because we were in every class together for the five years," says Shaman.

Anna Scott recalls that when she was on a work term in Toronto, there was a WatPub every week at a designated bar and any co-op students who were in town could drop in and catch up.

"All of a sudden you'd be back in your university community, discussing problems, sharing experiences and laughing," she says. "Last week, I had dinner with four engineering classmates, and nothing had changed."

Once forged on campus, Waterloo Engineering friendships continue to grow throughout the years and around the world. Alumni not only keep in touch by attending events and Reunion, but also through LinkedIn and other forms of social networking, including the Waterloo Engineering Hub of Ten Thousand Coffees.

Abbey Scott describes her time in Waterloo Engineering as an experience she'd recommend to any high school student and she frequently does just that.

"I am part of an amazing community that includes both classmates and other engineering students, and I'm confident that it will remain strong even after we graduate," she says.

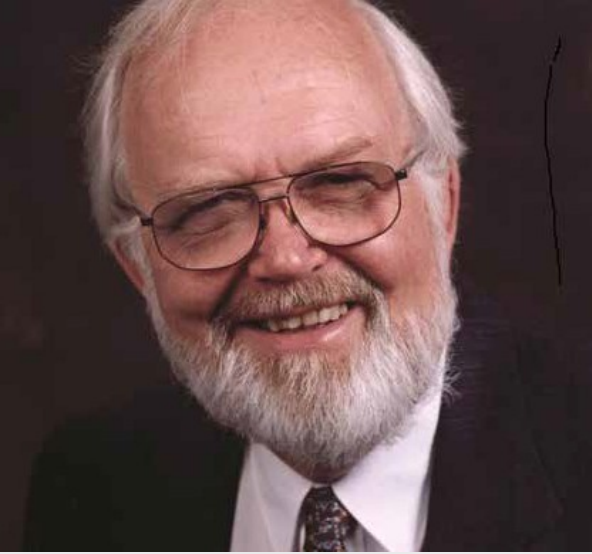
"That's one thing that's really special about Waterloo — it is a close-knit group of people working together," Anna says.

Turning to her father, Anna adds, "And that's what you were trying to build, right, dad?"

"Absolutely," Doug Wright replies with a smile.

C | All three of the Dhaliwal siblings became Waterloo Engineering students thanks to inspirational high school teachers and the Faculty's reputation. From left: Amar, Lakhvir and Kiran Dhaliwal.





Transforming building codes and communities

When Carl Turkstra (PhD '63, Civil) joined Waterloo Engineering's newly launched PhD program, building codes aimed to achieve absolute safety. Turkstra proposed a radical alternative: applying risk analysis instead.

Then-president Doug Wright ensured Turkstra's resulting thesis landed on all the right desks, paving the way to an illustrious academic career that spanned three countries and two decades. Along the way, Turkstra earned the American Society of Civil Engineering's "State of the Art Award" twice, helped to transform building codes around the world and developed what is now known as "Turkstra's Rule" for load construction in structural design.

In 1990, however, he gave up that career to take over his family's lumberyard during the throes of the recession. Over the next two decades, he grew it into one of Canada's largest lumberyards for building contractors.

Now, rather than relaxing in his retirement, Turkstra has launched three philanthropic foundations. The Turkstra Foundation focuses on disaster relief; Your Canada, Your Constitution advocates for political reform; and the Incite Foundation supports the arts in Hamilton, ON.

"I can't sing or dance or any of that stuff, but I understand how important arts and culture are," he says.

Nor has he forgotten his first calling. This year, he worked with Waterloo Engineering to fund an endowed chair and graduate program in urban engineering, setting the scene for more PhDs who will change the world.

Class Notes

1962

Class Reunion | 55 years

September 30, 2017

JACK KRUVV (Eng Physics '62) is currently writing an autobiography entitled *The Long Road for a Child Refugee to a University Physics Professor*. Several chapters of his book, which is mainly about his 40 years as a student and professor at Waterloo, were published in the University's alumni magazine. The two chapters entitled "Early Years of UW" were written from a student's viewpoint.



BILL ROHMER (Mech '62) retired from Campbell Soup Company in 1994. He previously worked at Procter

& Gamble and W.R. Grace, living in various Canadian and U.S. locations, as well as Trinidad, Australia, and England. He now resides in Lumberton, New Jersey.



JOHN ROPER (Elect '62) recently retired from his second career: a sailing instructor for 32 years. He continues

to write and publish in Gibsons, BC at www.tmipublications.com

1964



DAVID CLARK (Elect '64) says that engineering has been the perfect profession for him. He

worked in many places until 2016 and is in the process of moving to BC. He has five children and seven grandchildren.

david.maple.ridge@gmail.com



JACK ROBINSON (Chem '64, '66, '69) says that he never left Waterloo, staying on as a professor. Each

winter term he can be found in M3-2126, where he teaches a third-year statistics course to health studies students. "What a great place to spend one's career!" he says.

1965



RICHARD VAN VELDHUISEN (Civil '65) is a volunteer project manager for the construction of a 85-unit non-profit

senior citizen rental apartment complex in the heart of downtown Brockville, ON. This new building will have 30 subsidized units and will be the third senior citizen building owned by the non-profit Marguerita Residence Corporation. Richard says he's volunteering to give back to his hometown community.

1966



PAUL FEHRENBACH (Mech '66, '68, '72) and his wife Mary celebrated their 50th

wedding anniversary in May 2016. They also recently celebrated Paul's 10th anniversary of retirement as vice president AECL Nuclear Laboratories and special advisor to the AECL Senior VP Technology.

1967

Class Reunion | 50 years

September 30, 2017



RON FOSTER (Elect '67) reports that he's planning to travel to his 50th reunion this year in the car he left with in April 1967. "We've been to others ('92, '07), but this is the BIG one—50!"

GARY KIDD (Elect '67, '71) reports he's running a small corporation that designs/develops laser-based instruments and devices. The instruments are for greenhouse gas fluxes (CO₂ over ocean surfaces) and the devices are for breath analysis (CO₂, H₂O, biomarker gases).

www.gatstruments.com.

1969



ROMESH C. BATRA (Mech '69) was honoured with the 2016 ASME Robert Henry Thurston Lecture Award for outstanding contributions to the understanding of the physics of adiabatic shear banding phenomenon.

His work includes proposing shear band initiation criterion, thermomechanical material models and shear band width definition, and delineating effects of material parameters on its acceleration and deceleration.

RICHARD BEIFUSS (Elect '69) championed commercial/construction arbitration in the federal government in the '80s by designing and directing a construction dispute resolution process on behalf of the Minister of Public Works. He is currently the sole arbitrator on a \$150-million international arbitration contract.

doctorrichardbeifuss@yahoo.com



GARY WEDLAKE (Chem '69, '71) worked for four PVC compounding companies before starting his own compounding company in 2002. He continues to run Wedlake Industries, while finding time for woodworking, flint knapping and photography hobbies.

931-796-4999

1970



MILES LAUZON (Chem '70, '71 '75) reports that after a 35-year career in the forest products industry, he is enjoying retirement with his wife Linda in Cambridge.

VIC SANTORA (Chem '70, '71) and TOM LITTLE (Chem '70) report that their Class of 1970 Chemical Engineering would like to get together between the regularly scheduled five-year reunions. The Class will be getting together September 7-10, 2017. Contact either Vic or Tom for more details.

thomaslittle@rogers.com vshantora@sympatico.ca

1971



KEN HILL (Elect '71, Civil '76) reports that he has had a "fabulous 44-year career" performing the roles of project and deputy project manager, director of contracts/subcontracts and cost/schedule/data/risk controls manager

on \$26-billion worth of high-tech projects. Ken has managed project teams of up to 320 staff with companies including General Dynamics, Lockheed Martin, SNC Nuclear, Amec, Saint John Shipbuilding and Marshall Macklin Monaghan. Ken was awarded Lockheed Martin's "Award of Excellence" and is a proud recipient of the Paul Plumber Award.

ca.linkedin.com/in/kenhillprojectmanager

BAILY SESHAGIRI (Mech '71) has fond memories of the Breslau, the Blue Moon and the Heidelberg (starring Ozzie on the piano!) and good friends Parameswaran, Srinivasan, Shabeer Ahmed, Ramapriyan and others. He says he'll never forget his supervisor, Professor Gordon Bragg, described as a "scholar, gentleman and a great mentor."

1972

Class Reunion | 45 years

September 30, 2017



BILL CRAWFORD (Mech '72) received the J.P. Tully Medal in Oceanography from the Canadian Meteorological and Oceanographic Society. He recently retired after 36 years as a research scientist with Fisheries and Oceans Canada.

billcraw@telus.net

DENNIS W. KERR (Civil '72) retired in 2012 as chief foundation engineer of Peto MacCallum Ltd. He was a geotechnical consultant to the oil sands industry in Alberta for six years and a foundation/geotechnical consultant on major industrial, marine, transportation, commercial, institutional and residential projects in Ontario for 34 years. His memorable projects include: analysis of tailings dam stability and upgrading ports in Hamilton Harbour.

krdes.127@cogeco.ca



EDWARD (TED) MCRAE (Elect '72) reports that after 40 years of research in the French NRC in materials science, retirement in the Burgundy area now allows for a change of pace: cycling, oenology, Open University and travelling.

BILL SCHLITT (Mech '72) reports he's happily retired from OPG and contract work, and is enjoying his three grandchildren, travelling and time at his cottage.

bill.schlitt@bell.net

1974

BRUNO MARUZZO (Elect '74) has been working with a startup out of McMaster University, Digital Medical Experts (www.digitalmdexperts.com), that has developed technology to help doctors better deal with patients who have mental health issues. The initial product will be for depression, which affects more than 20 per cent of the population worldwide and costs hundreds of billions of dollars in direct and indirect costs. The next product to be developed is for bipolar disorder, followed by other psychiatric conditions, as well as neurological conditions.

maruzzo@sympatico.ca

WAYNE SCHLOTE (Chem '74) worked for Cobalt Refinery Limited in Cobalt, ON for five months prior to its closure in 1970. Classmates who shared the arsenic experience in silver refining and sledge-hammer manipulation were Gord Pearson, Don Linkert, and Arnold Hufnagel.



VINCENT SOWA (SD '74) retired after 40 years teaching graphic design at Conestoga College. Prior to retirement, he researched and developed the outline for the four-year graphic design degree program, which was implemented. He's now a part-time professor

in mechanical engineering at McMaster.

sowavm@mcmaster.ca



ROY TIMMS (Civil '74), owner of Timbro Design Build Contractors, was recently chosen as Niagara's Entrepreneur of the Year in the established business category.

info@timbrodesignbuild.com

1975



GLENN CASE (Chem '75) retired in April 2017 after 16 years with Canadian Nuclear Laboratories. He still resides in Port Hope, where he began his career in low-level radioactive waste management and environmental remediation.

geigerman2003@yahoo.ca

JIM HEIDINGA (Civil '75) plans to retire soon. He's mainly worked as a project manager/estimator doing residential development and ICI projects and is currently finishing inspection services on a \$20-million municipal building.



BRIAN WATKINSON (Arch '75) leads Strategies 4 Impact!, providing strategic advice and support to businesses in the design and construction sector, their associations and their

clients, with a current focus on introducing lean integrated project delivery in Canada.

brian@strategies4impact.com



J. BRYON WIEBE (Civil '75, '77) is grateful for the opportunities he's had as a result of his education and training from Waterloo. He's currently teaching part-time at Mohawk College in Hamilton. 226-377-6192

1976



LUCILLE BISH (SD '76) retired in March after 35 years with the Region of Waterloo. Her career path ranged from transportation planning engineer to Director Cultural Services responsible for museums, libraries and cultural heritage.

lucille.bish@gmail.com

GARY CARROLL (Civil '76) retired in August 2016 after a 40-year career spanning Whitby, Vaughan and Oshawa, highlighted with the presidency of Municipal Engineers Association and directorships on Ontario Public Works Association and Ontario Common Ground Alliance, as well as extensive involvement in the fields of municipal engineering, asset management and labour relations. He says: "I take away many personal memories and leave behind my gratitude to have contributed!"



SALEH FARUQUE (Elect '76, '81) has been teaching at the University of North Dakota since 2002. He is a US Fulbright Scholar (2011-12), author of five books, holds 16 US and three Canadian patents, and is the recipient of the outstanding professor of the year award in

2008 and 2011. Prior to joining UND, he spent more than two decades in the telecom industry in Canada and the U.S.

saleh.faruque@engr.und.edu



BERNIE SANDER (MSci '76) just turned 65 and still runs his own international management consulting company, Innovation Transfer Inc., specializing in employee engagement and idea management.

bsander@innovationtransfer.com

JOHN COVE (Mech '76) retired in January 2016 from Westcast Industries Inc.

1977

Class Reunion | 40 years

September 30, 2017



EDUARDO J. ESPINOSA (Mech '77) is planning to retire. He has worked in manufacturing (MILSA 1978-2007), sales (FerreMas 2008-2016), and design (ERUSA 1979-2017), all private companies. His public adventures include Electoral Institute of (the state of) Guanajuato and National Chamber of Industry (Canacindra-León).

erusa2@prodigy.net.mx

DOUG FUNSTON (Chem '77) retired in 2008 from OPG nuclear as a CNRC licensed shift manager after more than 31 years. Married with three children, he currently splits time between his homes in Cobourg, ON and Arizona.



IAN MACMILLAN (SD '77) retired from CableLabs as a principal architect in 2014 and has since occupied his time as first treasurer and now chair of IEEE Denver Section.

ian.macmillan@uwaterloo.ca



GARY SHORTT (Civil '77) retired from the chief operating officer position at the Toronto Transit Commission in July 2016 after 33 years at the TTC. Gary and his wife Kathy are enjoying condo life in Toronto, cottage life on Skootamatta Lake, being grandparents to James Joseph Shortt,

born in January 2017, and lots of entertaining/being entertained.

garyshortt@sympatico.ca



MICHAEL SMITH (Chem '77) and MCNS Environmental Systems have celebrated 20 years of providing quality industrial air pollution control equipment.

1978



RAYMOND FONG (Elect '78) has been working with Saudi Electricity Company in the Generation Operations Planning Department since 1991. He's planning to retire in the next year and return home to his family in Markham.

rayfong6@yahoo.com



HANK PETRANIK (Chem '78) is still working as a consultant in the energy sector and commuting back and forth between Vancouver and Calgary. He says he has no plans to retire anytime soon and enjoys spending time with his three grandsons in Vancouver. Although the bulk

of his work is in business development and commercial ventures, he still has his PEng designation in Alberta.

maxima-energy@shaw.ca

1979



TOM DEAN (Mech '79) continues to work at the University of Waterloo as director of technical operations in chemical engineering. He and his wife Terrie have been empty-nesters for a few years and enjoy travelling around North America to visit their four kids in various locations.

tjdean@uwaterloo.ca



JEFF FLEWELLING (Civil '79) retired in May 2017 from being a senior engineer with the City of Toronto. He will be backpacking across Europe from the beginning of June until the end of August.

jeffflewelling@rogers.com

ROBERTO KONIGS (SD '79) is launching a new company in Latin America in the change management (The Human Side of Change) field, helping organizations improve their agility using research-based tools and methodologies.

roberto.konigs@faculta.mx



BRUCE PALEY (Mech '79) retired from Babcock & Wilcox (Canada and USA) in 2002 and is now doing independent engineering consulting in the power sector. He mainly works for Sargent & Lundy (Chicago) and The World Bank (Washington, DC).

bkpaley@roadrunner.com



SELCUK SOYUPAK (Civil '79) retired from KTO Karatay University, Konya, Turkey in 2016. Now living in Ankara, Turkey, he is planning to travel and enjoy life.

selcuksoyupak@hotmail.com

1980



BILL CRICK (Elect '80) is doing PM for Cistel, an IT consulting firm at the Canadian Museum of Nature. He's thinking of going to three days a week to practise for retirement. Bill is also working towards his glider pilot licence.

Bill.crick@sympatico.ca



JIM ESTILL (SD '80) has been awarded the Order of Ontario for his sponsorship of 50 Syrian refugee families to Guelph. He is currently CEO of Danby Appliances.



RON FINLAY (Elect '80) is providing DJ/MC, music, sound and lighting services for corporate parties, anniversaries, and weddings, including some of his classmates' children.

info@perpetualrhythms.com

1981

PAUL ALARIE (Mech '81) retired from Aecon Mining in April 2016 after spending the last six years managing Aecon's oil sands fleet in Fort McMurray. Paul now manages motorcycling, cottaging and retirement business investments from Timmins, ON.



DOUG EVANS (Arch '81) has practised as a conservation architect in the UK since 1982 and has worked on some of England's most important historic sites, including medieval castles, a neolithic longbarrow and four cathedrals.
dougevans12@gmail.com

MIKE STEELE (Civil '81) reports that he's been working in Russia and India and recently returned to Canada.



JOHN TUMMERS (Civil '81) has been general counsel with Hatch for the past 26 years. He's very proud to have just placed an Iron Ring on his son Matthew's (Mech '17) finger. He says he has three other great kids.
John.Tummers@hatch.com

1982

Class Reunion | 35 years

September 30, 2017



BELWINDER BARN (Elect '82) has been working with product validation at PMC Sierra, which was acquired by Microsemi in 2016. He will retire this year to spend more time on hobbies including flying.
barnx@telus.net



CARLOS DÍAZ (Chem '82, '85) recently left his last place of employment in Brookfield to venture out on his own as an IT consultant. He and GERARDA (GERI) TINO (Arch '81, '83), continue to live in Oakville, ON and are delighted to have seen their daughter complete her undergraduate degree at Quest University in BC.
ceada58@gmail.com



SEAN GRANVILLE (Mech '82) is deputy chief nuclear officer at OPG, following three years as CNO of New Brunswick Power. Sean and Karen (BMath '82) have two kids and (shortly) three grandchildren.
seanworkipad@gmail.com



MIKE LOW (SD '82) retired after 35 years in the Calgary oil & gas industry. He and wife Jo-Ann will spend more time at their place in Fernie, BC.
mj_low77@telus.net

1983



JEFF BENNETT (Chem '83) retired after 32 years at Canfor Pulp in Prince George, BC, most recently as customer service manager. Jeff and Gill will split their time between winters in PG with their family and summers at the cottage near Minden, ON. Jeff can be contacted through LinkedIn.

1985

MARK EWANCHYNA (Chem '85) is enjoying retirement in Calgary.
mark.ewanchyna@gmail.com

DAVID OVERBEEKE (Mech '85) has been President and CEO of Brake Parts Inc. since July 2008. He spent 20 years with GE upon graduation and now owns three separate companies.
David.overbeeke@brakepartinc.com

1986

RALPH HEMPEL (Elect '86) reports that after raising two engineers and a doctor, he and Christy have moved to Denmark, where he is the senior manager of firmware at LEGO.
ralph.hempel@LEGO.com

1987

Class Reunion | 30 years

September 30, 2017



AL ASHTON (Mech '87) just retired after 30 years at the Bruce Nuclear Power Development.
al.ashton@hotmail.ca



JAMIE BRITTON (Mech '87) has been working as a project manager at BC Hydro since 2014. Previously, he was a project manager at various large private engineering firms in Toronto and Vancouver.
britton.jamie@gmail.com



SUSAN (HAUSFELD) MOOTE (Mech '87) is director of IT operations for Daimler Trucks North America in Portland, OR and has been happily married to DON MOOTE (Mech '84) for 30 years. She's looking forward to retirement in 2018.
mootefam@msn.com



LARRY WOOLNER (Mech '87) is GM and VP Global Engineering at Almex Group, Parry Sound, ON, and Past Commodore (and founding member) of Sail Parry Sound Inc. Previously, he was GM at Connor Industries/Stanley Boats.
larjo@cogeco.ca

1988



ALISON BROOKS (Arch '88; DEng Hon Causa '16) goes from strength to strength with the imminent completion of the University of Oxford's Cohen Quad,

and Ely Court contending for the EU Mies Van der Rohe Award.

alison.brooks@alisonbrooksarchitects.com



ABYD KARMALI (Chem '88) moved from management consulting to finance in 2007 and now serves as head of Climate Finance at Bank of America Merrill Lynch, a global role

based in London, UK focused on mobilizing capital to address climate change.

SHAYNE SMITH (Mech '88) is taking his first "break" from full-time employment following a 29-year career at Tetra Tech (formerly Wardrop Engineering). He and his family, Pam and Tyber, will continue to live in Pasadena, California. Shayne continues to support Engineers Without Borders.

shayne.smith39@gmail.com

1989

GREG DALTON (Mech '89, '91) completed his PhD at Laurentian University in 2014 and is now teaching manufacturing engineering at the College of the North Atlantic in St. John's, NL.



MATTHEW TIGHE (Chem '89) has worked as director of operations for Luxfer Gas Cylinders since December 2012 in Riverside, California. He previously worked for

Pactiv Corporation for 11 years in various roles including plant manager.

ecgt_jhmt@yahoo.com

1990



IBRAHIM OMAR HABIBALLAH (Elect '90, '93) is an associate professor in the EE Department at King Fahd University of Petroleum &

Minerals. He acted as Head of Energy Section in 1998 and EE Chairman in 2007.

ORLA HEGARTY (BMath '90, MSci '93) has recently been appointed Postmaster in the quaint community of St Vincent's, NL.

ohegarty@gmail.com

1991



DARIA FILIP (Mech '91) has been living in Paris since 2014 and currently works at the American School of Paris teaching junior science and physics. Daria had her first Parisian photography

vernissage in May.

8daria@gmail.com



GREG HAMMOND (Mech '91) retired in 2012 after working at Husky for 21 years. He started a small business to sell soapstone

sculptures that he makes.

hammondgmv@cogeco.ca

1992

Class Reunion | 25 years

September 30, 2017



ANDREW REEVES-HALL (Comp '92) is a certified ScrumMaster® with additional responsibility for managing the transformation of teams

to an agile mindset using scrum sprint and Kanban at Surrey Satellite Technology Ltd (SSTL) in Guildford, Surrey, UK. He lives in Whitchurch, Hampshire, UK.

Andrew@Reeves-Hall.net



International video success story

Ross Video may not be a household name, but if you've watched the Oscars, television almost anywhere in the world, or a game at just about any major stadium, you've probably seen the Ottawa company's live-event video technology in action. CEO David Ross (BASC '91, Computer) joined the family business after graduation, growing it into an international success story with almost 700 employees serving customers in over 140 countries.

Getting there meant eschewing a lot of conventional business wisdom. Ross has avoided external investment, allowing him to focus on long-term growth rather than quick profits. Unlike most Canadian technology companies, he invests heavily in sales and marketing. Perhaps most radically, all Ross Video products are manufactured here in Canada. "It's a huge strategic advantage," he says.

Ross fell in love with technology in 1975 when his dad brought home one of the world's earliest PCs. That passion led him to Waterloo, where he benefited from "fantastic" co-op work experiences and learned lessons he still applies today — like how to deal with a mountain of work and the value of collaborating with smart people.

In 2016, he won an Emmy and was named Ottawa's CEO of the Year. Just last month, he received an honorary doctorate from the University of Ottawa. But Ross aims to achieve even more in the future.

"Ross Video is to me like a never-ending work of art," he says. "There's always more of the canvas to paint on."



Sky's the limit

Whether she's nailing a perfect inside loop from the cockpit of her Bellanca Decathlon, or managing engineers at ArcelorMittal Dofasco, Andrea Kuciak (BAsc '00, Mechanical) rises to any challenge.

"It's my personality. I like learning new things," says Kuciak, who began her flying career in 1995 as a high school student after visiting the Southern Ontario Soaring Association Gliding Club in Rockton, ON.

Since that first flight, Kuciak has gone on to become a glider aerobatic instructor, a tow pilot and a competitive aerobatics pilot along with her husband, Scott McMaster — who, she likes to joke, she only married for his airplane. Kuciak is also the Canadian Harvard Aircraft Association's only female pilot and one of just a handful who fly the World War II training aircraft.

It was those first few years soaring above farmers' fields that got her interested in mechanical engineering. Originally a Waterloo applied physics student, Kuciak transferred to engineering in second year once she realized the hands-on technical and theoretical aspects of flying were applicable to an engineering career — one that has since given her 17 years at steel company Dofasco in Hamilton.

"Flying really is closely tied to engineering," she says. "I just always want to know how things work."

1993



TONY SAVOR (Elect '93, '97) leads the engineering of Facebook's online data storage systems, providing almost all of the data to Facebook's online service.

He works in Menlo Park, California.

1994



MARCELO S. ALENCAR (Elect '94) has just published his 20th book, *Cellular Network Planning*, by River Publishers, Netherlands. He is

president of the Institute of Advanced Studies in Communications (Iecom), and chair professor in the Department of Electrical Engineering, Federal University of Campina Grande, Brazil.



MIKE BONDI (SD '94) has been working as a consultant with Business Improvement Group since 2008. In 2015, he founded Big Data Science and

works with clients to improve decision making through data analytics.

mike@bigdatascience.ca



LIEH WANG (Mech '94) started in January 2017 at Sentry Investments as VP and Senior Portfolio Manager after lengthy stints at three other major

financial services firms since graduation from Waterloo.

lpwang54@gmail.com

1996



SOL HAROON (Elect '96) is pioneering in sustainable energy and sustainable building design in the greater Atlanta area in Georgia. Sol recently

designed President Carter's 1.3MW solar PV power plant in South Georgia. He is pursuing graduate studies at the College of Architecture at the Georgia Institute of Technology.

sol2spirit@gmail.com

1997

Class Reunion | 20 years

September 30, 2017

1998



RAYMOND CHAN (Civil '98) created a technology startup in Hong Kong. He builds an open gaming platform that allows game developers to build games

for casinos worldwide.

chan@tgginteractive.com

1999

JEFF BARNARD (Civil '99) started his own engineering firm specializing in the design and supply of hydro mechanical equipment (gates and hoist), project management and technical advisory services related to hydro power, flood control, water treatment, irrigation and transportation canals. Barnard Hydro Solutions Inc. is also the Canadian Representative for the Kouris Centuri Turbine — a patented hydro turbine design for low head applications.

ROCK LEUNG (Comp '99) is a user experience researcher at Samsung R&D Canada in Vancouver and was previously at SAP. In 2011, he obtained a PhD in computer science from the University of British Columbia, specializing in human-computer interaction research.

www.rockleung.com

2001



SHELDON FERNANDEZ (Comp '01) has been working as the vice president of technology at Infusion, a company for which he established a

Canadian presence after graduation. In March 2017, Infusion was acquired by Avana, a leading provider of digital services.

Sheldon.fernandez@gmail.com

WHITNEY TYERMAN (Mech '01) plays the Blues throughout Tibet. He reports he's been married twice and has enough offspring for pick-up football.

2002

Class Reunion | 15 years

September 30, 2017

PHILIP ZOLDAK (Mech '02) recently joined HPD-Honda Racing in California as a principal Engineer II-Combustion R&D responsible for leading the combustion technology research and development for the company. He has published over 20 technical articles, has four U.S. patents in the field of combustion systems R&D and has received several speaker awards. He is currently pursuing a part-time PhD in mechanical engineering, with a focus on fuel injection and combustion, at Michigan Technology University. He is expected to complete his degree in 2018.

pszoldak@mtu.edu

2003

ELIZABETH TILLEY (Enviro '03) completed a PhD at the ETH Zurich in Development Economics and is now a senior lecturer at the University of Malawi in Blantyre, Malawi.

etilley@poly.mw.ac

2004



CHRIS DECK (Comp '04) continues to work at architecting medical and wireless components with ON Semiconductor. As part of this role, he has become a contributor to the future of Bluetooth technology in extremely low-power and medical applications.

chris.deck@gmail.com



KRISTIN MCCLEMENT (Elect '04) recently co-founded GoodBuyGear Inc., a startup that is building a new way for parents to buy and sell used gear online. Previously, she was VP of product and partnerships at Payfone Inc., a pioneer in mobile identity authentication for digital channels.

kristin@goodbuygear.com

2005



JACOB WEBER (Civil '05) is the senior director, development for a major commercial developer in Western Canada. Previously, he spearheaded a large format retailer's expansion into Canada.

weberjr@gmail.com

2006



SHAHD ATTAR (MBET '06) recently took on a new role at Saudi Telcom, the largest service provider in the Middle East. She was the first woman to be hired in a 20,000+ organization heading a department focused on the female consumer segment. In addition to that, she started a professional network inspired by Communitex.

www.arabnews.com/node/1053971/saudi-arabia

2007

Class Reunion | 10 years

September 30, 2017



PAUL BISANTI (Mech '07) has been working as a construction project manager and real estate development manager for Lanca Contracting Limited.



CHARLING LI (Mech '07) recently completed a master's degree in urban studies at Simon Fraser University focusing on social sustainability and the built environment. This led to a field research trip to sustainable neighbourhoods in six European countries. She currently works as a sustainability planner at Stantec in Vancouver.

li.charling@gmail.com



GORDON VALA-WEBB (MMSc '07) has authored *Building Smarter Organizations: How to lead your zombie organization back to life*. The book is an actionable guide to helping your organization adapt to our volatile and digital world.

www.buildingsmarterorganizations.com/

2008



LUC GALLANT (Comp '08) switched jobs in November 2015 and started as a senior plant engineer with OPG in Timmins, ON. He also became a new father.

lucgallant@gmail.com

WAYNE MIRANDA (Mech '08) is celebrating the fifth anniversary of founding Growth Mosaic in Ghana to bridge social-purpose businesses with impact investment. The firm includes 18 people across two offices and is expanding across West Africa.

wayne@growthmosaic.com

2010

GARY ABBOTT (SD '10) moved to London, England last year to support D2L's growing international business as a senior solutions engineer after three successful years driving growth in North America.

Gary.Abbott@D2L.com

2011



HASSAN MOSTAFA (Elect '11) has been working as the CEO of IP Valley Incorporated since August 2016. Previously, he was a postdoctoral student at the University of Toronto for two years and received an NSERC Postdoctoral Fellowship.

hmostafa@uwaterloo.ca

KIM OSBORNE (Mech '11) married Hector Rodriguez in June 2016 at her family's cottage in Muskoka. She and her husband currently live in Toronto with their dog Penny and cat Oreo.

kim.m.osborne@gmail.com



Pilkington Photography

Flying high with the circus

The reason Sara Greenberg (BASC '14, Systems Design) gave when requesting a deferral of her master's degree was that she was running away to join the circus.

Although it may seem farfetched, that's exactly what she did. This past spring, the systems design engineering grad student travelled to China, where she is performing on a two-year contract with Cavalia, a circus show that features equestrian and acrobatic acts.

Greenberg's passion for circus acrobatics began at 14 while growing up in Halifax. Since then, she has performed with Circus Orange, Equilibrium Circus, No Parachute Theatre and many other groups.

Greenberg admits that when she started her grad work she often felt like two different people: a student by day and a circus performer flying through the air at night.

"It's like I became some type of superhero," she laughs.

Her double life came together when she incorporated her research in human body pose estimation and tracking into her performance work. The result was Auras, an innovative aerial performance piece with awe-inspiring live projection mapping.

While Greenberg has never worked with horses and doesn't speak Mandarin, she is enjoying her once-in-a-lifetime experience. Another experience she looks forward to is finishing her degree.

"I genuinely like what I've been working on and have come too far not to complete it," she says.

2012

Class Reunion | 5 years

September 30, 2017



ALBERT BEYGINIAN (Mech '12) has been working at S&C Electric Canada Ltd. since 2009, and as product engineer since 2012. He's

responsible for product design and development, product support and continued improvement. Previously, he worked at Omron Automotive Electronics. He's had a patent awarded for design and development of underground high voltage switch motor operator.

albert.beyginian@sandc.com

MARLA DESAT (Chem '12) has joined the Standards Council of Canada, a Crown corporation, as a sector specialist. Previously, she worked in federal regulatory development and administration at Environment and Climate Change Canada.

marla.desat@scc.ca



MARWA ISMAIL (Elect & Comp '12) has been working as a database administrator in the Centre for Sight Enhancement at the

University of Waterloo's School of Optometry since 2014.

mnismail@uwaterloo.ca



PREM KALEVAR (Mtron '12) launched Waterloo Alumni Angels in March 2017. It is a new angel group focused on investing in the best University of Waterloo alumni-founded startups.

prem@waterlooomniangels.com



ALEX LEE (MAZEROLLE) (Nano '12) has been working as a program manager at QinetiQ since August 2015 on the Mosquito Unmanned

Helicopter Program.

Mazerolle@gmail.com

DAVID NGUYEN (Mtron '12) teaches a night class on fabricating high-end boutique soap.



RAJESH PALIT (Elect & Comp '12) is an associate professor in electrical and computer engineering at the North South University, Dhaka.

2013



ADITYA DHAR (Comp '13) is a client manager at IBM Canada and is starting his MBA at Rotman this fall. Previously, he was

an analyst at Accenture.

adityad@ca.ibm.com



JOHN LEE (Mech '13) is relaxing until he attends WLU full-time for his MBA. Previously, he was in sales at 2G Robotics, and before that was an

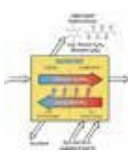
equity trader for a prop-shop in Toronto.

2014

MICHAEL ARMSTRONG (Mech '14) has been working for Siemens Wind Power in the Netherlands calculating loads for offshore wind turbines since finishing his MSc in August 2016.

STEPHANIE KOLTUN (Arch '14) is pursuing her master's degree in interactive technology at New York University. Previously, she worked as a designer at Payette in Boston, MA, during which time she developed an online tool for evaluating indoor occupants' thermal comfort and designed research and teaching labs for the Amherst College New Science Center.

stephanie@anothersideproject.com



HOSSEIN ORDOUEI (Chem '14) has been working as a post-doctoral fellow on a patented Novel Ultra-low Water Oilsands Recovery Process (NUWORP), which is a great substitution for existing oil sands processing with hot water.

mhordoue@uwaterloo.ca



SHANAE VANDER TOGT (MBET '14) recently began working in marketing and communications for one of Kitchener-Waterloo's oldest companies, Cober Solutions, as part of its new digital agency. Previously, she worked for

Magna International and a creative agency.
shanae.vandertogt@cobersolutions.com

2015

TARJOTE CHAGGAR (Mech '15) has been working as a systems integration engineer in the Firmware organization at Tesla Motors since July 2015, focused on prototype torque-production test platforms.

tarjotechaggar@gmail.com



AMAR GANDHI'S (MBET '15) company, AN Commerce, was ranked the fifth-fastest-growing company in Canada by PROFIT 500. In 2016, the company surpassed revenue of \$100M and is on track to reach \$300M in revenue this

year. The company has also been featured by Facebook and Shopify. The company, co-owned by Amar and his brother, Nirav Gandhi, currently has around 120 employees and an office and distribution centres in Canada, the United States, China and the United Kingdom.



MINGSONG LIU (SD '15) is working for General Motors as an infotainment system software developer at its Canadian headquarters.

mingsong.liu@gm.com

HAYDEN SOBOLESKI (Nano '15) has been working for Mustang Survival since 2016. As an R&D engineer, he is responsible for identifying new technologies and integrating them into the company's lifesaving and recreational products.

2016



ABDUL AL-HAIMI (MBET '10, MSc '16) was busy running his own startup at Velocity Garage last year. Currently, he is leading PerkinElmer's software innovation lab, located at Communitech, to solve key health-care problems and experiment with new technologies.

abdul.alhaimi@perkinelmer.com



MUHAMMAD UMAR FAROOQ (Chem '16) started working for Tyromer Inc. on devulcanizing scrap rubber to form Tire Derived Polymer (TDP) rubber that is used to make tires.

Mu3faroo@uwaterloo.ca



JACK FORBES (Mgmt '16) has been hard at work building a co-op housing site called PadPiper! While balancing a full-time position at Salesforce in San Francisco, he is focused on his site, which helps students find housing during co-op terms.

www.padpiper.com



BROCK LASCHOWSKI (Mech '16) is completing his PhD in biomedical engineering at the University of Toronto and works at the Bloorview Research Institute in the Holland Bloorview Kids Rehabilitation Hospital. His research focuses on developing new theoretical models of human motor control in the interests of optimizing the design and controls of robotic lower-limb prosthetics for amputee gait neurorehabilitation.

brock.laschowski@mail.utoronto.ca



RYAN MARCHEWKA (Nano '16) has been working as CEO at Halion Displays, a company he co-founded in third year. Halion is building a new reflective display technology.

ryan@halionays.com



SHAHZADA SHAHUKH (Elect & Comp '16) has joined CISCO as a software engineer. His most recent research paper, titled "A novel feature fitting and simulation algorithm for estimating electric vehicle demand", was presented at the 2016 IEEE Electrical Power and Energy Conference.

shahzada.shahrukh@gmail.com

In Memoriam

The Faculty of Engineering expresses our deepest sympathy to the family and friends of the following graduates:

Kenneth H. Benn (MSci '91)
Clifford G. Blake (Mech '75, MSci '93)
Martin D. Bumbulis (Civil '88)
Thomas A. Clarkson (Mech '66)
Barry F. Hiscock (Applied Chemistry '72, Chem '79)
Michael J. Kacsor (Mech '75)
Ashwani Kohli (Chem '87)
Rodney G. Kuehn (Chem '82)
Pamela A. MacGillvray (Mech '97)
Francois-Teresiano Maggioni (Arch '75)
Keith A. Martin (Elect '83)
Glen R. McGee (Mech '81, '83)
Robert E. Moore (Civil '94)
Philip O. Redfern (Civil '69)
Clifford Schultz (Mech '62)
John W. Shore (Mech '71)
Alison M. Smith (SD '06)
Roger Szydziak (Mech '81)



Greetings Alumni

It's hard to believe that Waterloo Engineering is celebrating its 60th anniversary this year! We're now almost 44,000 alumni strong, which equals an incredible amount of engineering wisdom and talent right around the world.

Last year, we launched our global network of engineering alumni through Ten Thousand Coffees. This online networking service, founded by University of Waterloo alumni and free to users, offers a personal approach to alumni networking. Within the platform, only Waterloo Engineering alumni are part of the "Waterloo Engineering Hub" so you know it's exclusive and highly relatable.

The idea behind Ten Thousand Coffees is to sign up and then reach out to your classmates (no matter the year of graduation) for a virtual or real-life coffee and see where that conversation takes you. It might be to connect about a new career opportunity, a new idea, a new employee, or to find old friends. Join today at tenthousandcoffees.com/hub/waterlooeengineering.

If you find yourself visiting the University of Waterloo, please give me a call or email me. I'd be happy to buy you a cup of coffee at the C&D and give you a tour of the newest buildings on campus.

And if you have any story suggestions for a future issue of WEAL or eWEAL, please send them to me. Some of our best stories come from your suggestions!

Sincerely,

A handwritten signature in black ink that reads "G Brestovacki".

Gosia Brestovacki
gosia.brestovacki@uwaterloo.ca
Senior Alumni Officer
Faculty of Engineering

LinkedIn: [linkedin.com/in/gosiabrestovacki](https://www.linkedin.com/in/gosiabrestovacki)
Ten Thousand Coffees: tenthousandcoffees.com/profile/gosia-brestovacki

Upcoming Events

JULY
1
2017

Canada Day 150th Celebration

Time: All day
Locations: Columbia Lake Fields, University of Waterloo

Join us as we celebrate 60 years of innovation at the University of Waterloo and Canada's 150th anniversary of Confederation.

JULY
14
2017

Engineering Day and The Tool's 50th Birthday Celebration

Time: 11:00 a.m. to 1:00 p.m.
Locations: CPH Courtyard, University of Waterloo

Celebrate Waterloo Engineering @ 60 and The Tool's 50th Birthday! Event includes a BBQ Lunch featuring the famous Boggan Burgers, fun treats and games, a colour throw at noon and much more.

SEPTEMBER
30
2017

Waterloo Engineering Class Reunions in 2017

Time: Various, all day
Locations: University of Waterloo

Feel like you're a student once again by attending a lecture from the Back-to-the-Classroom series featuring professors Larry Smith and Alexander Wong or the dean's reunion lecture. Explore campus by attending the Open House in Engineering 5 and take a student-led tour featuring cutting-edge labs. Then, celebrate the anniversary of your graduation with several special events taking place in the evening. Options may include an Iron Ring Ceremony, the Reunion Dinner at Crowne Plaza or the Oktoberfest Dinner and After Party at the Bomber.

This year's reunions include:

- 55-Year Reunion for the Class of 1962
- 50-Year Reunion for the Class of 1967
- 45-Year Reunion for the Class of 1972
- 40-Year Reunion for the Class of 1977
- 35-Year Reunion for the Class of 1982
- 30-Year Reunion for the Class of 1987
- 25-Year Reunion for the Class of 1992
- 20-Year Reunion for the Class of 1997
- 15-Year Reunion for the Class of 2002
- 10-Year Reunion for the Class of 2007
- 5-Year Reunion for the Class of 2012

Register for reunion events at:

uwaterloo.ca/engineering/alumni/reunions

OCTOBER
14
2017

Go ENG Girl

Time: 9 a.m. to 1 p.m.
Location: University of Waterloo

This annual event gives girls in Grades 7 to 10 the opportunity to learn about the amazing world of engineering.

NOVEMBER
24
2017

Annual Alumni Dinner in Hong Kong

Time: Evening
Location: Hong Kong, China

Join your University of Waterloo classmates at this annual alumni dinner in Hong Kong.

JANUARY
19
2018

Waterloo Engineering Alumni Ski Day

Time: 8:30 a.m. to 5:30 p.m.
Location: Osler Bluff Ski Club,

Town of the Blue Mountains (near Collingwood), ON
Join your University of Waterloo classmates at this breathtaking private ski resort to ski and snowboard for the day, followed by an après ski.

NEW
DATE!

SEPTEMBER
22
2018

Waterloo Engineering Class Reunions in 2018

Time: Various, all day
Location: University of Waterloo

The Classes of 1963, 1968, 1973, 1978, 1983, 1988, 1993, 1998, 2003, 2008 and 2013 are invited back to campus to celebrate a milestone anniversary. Mark your calendar!

For the latest Waterloo Engineering alumni events, visit uwaterloo.ca/engineering/alumni

Reunion Class Reps Wanted!

Volunteer to be a Reunion Class Rep for your upcoming class reunion and be part of the action! Register today by emailing engineering.alumni@uwaterloo.ca or calling the Alumni Officer at 519-888-4567, ext. 36838.



Impact investment

Growing social-purpose businesses

Located beside Côte d'Ivoire and Togo, Ghana may seem a world away from Waterloo, Canada. But for Wayne Miranda (BASc '08, Mechatronics) the West African country is the perfect spot to address some of the planet's most pressing challenges — poverty, health and the environment.

Miranda is celebrating the fifth anniversary of founding Growth Mosaic in Ghana. The company bridges social-purpose businesses — think those that offer rural ambulance services or improved seeds for farming — with impact investment. Investors support causes they care about and generate financial return while small- and medium-sized businesses grow to offer more local jobs and social programs.

Growth Mosaic employs 18 people in two offices to help clients improve and attract investment dollars.

"West Africa is the place to be," says Miranda, who grew up in Markham, Ontario. "There's lots of opportunity."

Take one client, Bamboo Bikes, which crafts inexpensive bicycle frames from sustainable bamboo. Miranda rode around on one for a year. Meanwhile, Growth Mosaic

has helped other companies improve their businesses as they turn local waste into fertilizer, produce cosmetic moringa oil, create fortified cereals and build affordable home toilets.

Foundation to succeed

As an engineering student, Miranda volunteered in Africa with Engineers Without Borders. After later working with a private consulting and organizational development firm in Malawi and an agricultural development firm in Ghana, Miranda knew he was meant to help local companies there.

While his mechatronics degree can feel far removed from his day-to-day business now, he says the program provided the foundation he needed to succeed: a problem solving and design thinking mindset, as well as analytical abilities.

"That whole experience of learning on the job — and learning how to learn at Waterloo — has been quite transformative," he says. "That is also the sort of culture we're trying to build at Growth Mosaic."

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