The Civilian

One Department. Two Great Programs: Civil and Mineral Engineering / Issue 19 / June 2015

Pan Am / Parapan Am Games

CIVIL PHD STUDENT IS RANKED SIXTH IN THE WORLD GOING IN

Shear Design

MASSIVE SPECIMEN TESTED IN OUR STRUCTURAL LABS

The Civilian

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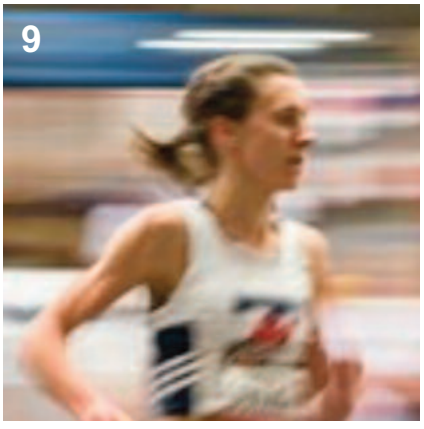
Published By
Brent Sleep

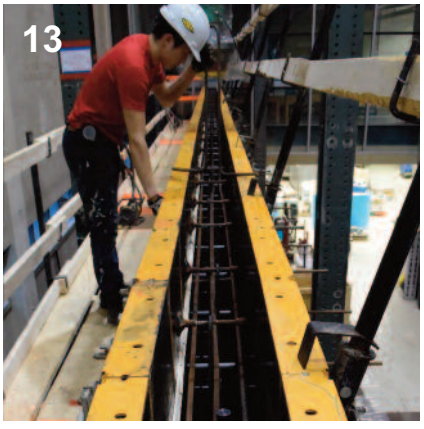
Managing Editor
Nelly Pietropaolo

Designed and Edited By
Colin Anderson

Writers
Colin Anderson
Evan Bentz
Paul Fraumeni
Jamie Hunter
Tyler Irving
Terry Lavender
Amy Stupavsky
RJ Taylor

With Photography By
Roberta Baker





"There are always problems to be solved. This is what engineering teaches you."
- PEY: What students and employers are saying, Page 11

Chair Chat

Here in the Department of Civil Engineering we are busy readying for another bustling academic year. The summer calm also affords us a wonderful chance to update you on all the amazing accomplishments of our students, faculty and staff in the year just finished. In this issue of the Civilian we will tell you about a new study that is helping point the way to greener, cleaner megacities, research that sheds new light on the hidden environmental cost of some "green" technologies, and the test of the largest concrete specimen ever carried out in our structures labs.

We'll also introduce you to a whole new slate of award-winning students and amazing alumni, like track star turned PhD student Sasha Gollish. Sasha is currently vying to represent Canada at the Pan Am / Parapan Am Games later this summer in Toronto. She's also the first student admitted to our new doctoral collaborative program in engineering education, a program designed to focus on research and learning at the nexus of education and engineering practice. Sasha's research findings will help inform future instructional initiatives across the Faculty of Applied Science and Engineering here at U of T.

An international team of researchers led by our own Prof. Chris Kennedy recently released a comprehensive guide to the resource uses of the world's biggest megacities. This new index will be used to help identify initiatives and best practices that can be shared across borders.

The media was also buzzing over another study out of Prof. Kennedy's research group that indicated certain technologies marketed as "green" alternatives may actually be more energy intensive than their traditional counterparts, depending on geographical location. Findings like these serve to remind us to be thoughtful in our adoption of technology.

Our students are answering this call, from the Lassonde Mineral Engineering Program's Paige Clarke, who volunteers with her local Community Living organization, to Alec Knowles, whose Civil MASc project involves a smart-phone app that is helping optimize public transit networks.

Please be in touch with us and let us know what is new and exciting in your lives and careers. We love hearing from our great alumni all over the world.

Have a safe and happy summer!

Brent Sleep

Brent Sleep
Professor & Chair
Department of Civil Engineering

A Career of Firsts

Marcia Lamont Scott (CivE 4T7) was the first woman in Ontario and only the second woman in Canada to graduate with a civil engineering degree. She reminisces about following her dream, survey camp, and being a trailblazer in a male-dominated field.

I never thought of engineering as a man's world. When I was nine years old I decided that I wanted to be a civil engineer because my mother's father was a civil engineer. I used to play with his drafting equipment and I was fascinated by the idea of business travel. I told my parents what I wanted to do, and they were very supportive. Both of my parents believed that if you put your mind to it, you could accomplish your goals, and they instilled that in me. I grew up thinking there was no difference between men and women.

During the summer between grades 12 and 13, long before I applied to university, I decided to get a job with a surveyor to get ahead of the game and learn in the field. W. S. Gibson, a surveyor who worked with his two sons, agreed to take me on unpaid. They were wonderful and patient with me. I remember learning how to use a transit on my very first day. This was wartime, and the younger son was in the army reserves. After I started work, he was called to go overseas, and that's when they started paying me. I remember getting my first cheque and dancing all the way home from the bus stop. I worked for them for three years.

When I applied to civil engineering, the University of Toronto initially refused me because of survey camp; there were no facilities for women, and the administration was worried about a girl being up there with all these young men. I was very upset, and my mother said she'd look into it. She called the president's office. In addition to being president and later chancellor of U of T, Henry John Cody was also involved with Havergal College, my high school. His secretary was an old friend of my mother's, and she pushed for me to get in. Eventually the university agreed to accept me on the condition that I have a chaperone at survey camp.

When the summer of second year rolled around, it was time to go to survey camp for six weeks. There were four surveyors from Jamaica coming to take the course with us, and one of them was married. His wife acted as my chaperone. I boarded with her and her husband in a four-bedroom cabin away from the main bunkhouse. One of my most salient memories is taking my sail boat out on Gull Lake on August 15, 1945. I could see everyone jumping and waving on the dock for me to come in; the war in the Pacific had just ended. Each graduating year decorates the trusses in the dining hall as a memory of time at survey camp. For our year it was simple, it was the end of WWII, so we all worked together to paint the dates of the war, maps, and the ends of the wars in Europe and the Pacific respectively.

Survey camp was a great experience. Not only did we learn all about surveying, but camp brought the whole class together in a way that we became like family. I met my husband in that class. We all became close, and some of those people are still our dearest friends and godparents to our children. The main thing I learned at survey camp has nothing to do with engineering and everything to do with life: Everyone has something to offer. It was invaluable to learn how to work with colleagues in a group. It was a great addition to our classroom studies. We did surveying on campus, but it wasn't as cohesive.

I'm really surprised when people ask me whether I faced harassment, or if some people were more critical of me because I was a woman in engineering. My experience was just the opposite: everyone was pulling for me to do well. My professors, my classmates, and the people I worked for all wanted to see me make it.

Only two negative experiences stick in my mind, and they're laughable now. I was called in for an interview at a firm in Niagara Falls. When I arrived, the man in charge told me they weren't hiring anyone, but he just wanted to see what a woman engineer looked like. When I graduated, I was also refused entry into a continuing education class at Canada Hydro, which is funny because I ended up working for them for two years.

I graduated from U of T with honours in 1947. I didn't look at myself as a trailblazer, but I know engineering is still a male-dominated field. My advice to girls thinking about a career in engineering is to make sure their best subjects in high school are math and science; they need to be well prepared! My differential equations professor at U of T told me that if I'm going to be in a man's world, I can't be equal—I need to be better. That's good advice, too!

Marcia Lamont Scott
TORONTO

STAY IN TOUCH! We welcome your letters, stories, and updates sent to cd.anderson@utoronto.ca.
We respond to everything you send and will publish what we can.

Photo: Megacities such as Seoul, Korea (pictured) are home to 6.7 per cent of the world's population, yet they consume 9.3 per cent of global electricity and produce 12.6 per cent of global waste (Photo: Seoul Metropolitan Government).

Megacity metabolism: is your city consuming a balanced resource diet?

New York is an energy hog, London and Paris use relatively fewer resources and Tokyo conserves water like a pro. These are just a few of the findings from a new study on "megacity metabolism"—the world's first comprehensive survey of resources used and removed in each of the planet's 27 largest metropolitan areas.

Led by engineers at the University of Toronto, an international team of researchers examined data on how resources pass through the globe's largest cities, such as burning natural gas for heating, using electricity for public transit or disposing of solid waste and wastewater. Published this week in the journal Proceedings of the National Academy of Sciences, the findings could point the way toward strategies to make cities cleaner, greener and more sustainable—or at least less greedy.

Megacities—metropolitan areas with populations greater than 10 million—continue to grow in size and economic prominence. In 1970, there were only eight megacities across the world. This number grew to 27 in 2010, and it's expected to reach 37 by 2020. These urban areas currently generate 14.6 per cent of the globe's total GDP, but they also consume resources disproportionately.

The study found that today's megacities are home to only 6.7 per cent of the world's population, yet they consume 9.3 per cent of global electricity and produce 12.6 per cent of global waste.

According to U of T civil engineering professor and industrial ecologist Chris Kennedy (CivE), some cities are guiltier than others.

"The New York metropolis has 12 million fewer people than Tokyo, yet it uses more energy in total: the equivalent of one oil supertanker every 1.5 days," he said. "When I saw that, I thought it was just incredible."

Kennedy, also a senior fellow at the Global Cities Institute, explained that some of the differences have to do with geography: colder megacities like Moscow and New York use more fuel for heating. Another factor is economic activity.

"Wealthy people consume more stuff and ultimately discard more stuff," he said. The average New Yorker uses 24 times as much energy as a citizen of Kolkata, and produces over 15 times as much solid waste.

Yet as can be seen by comparing New York and Tokyo—both relatively rich megacities in temperate regions—wealth and geography aren't everything. Tokyo's efficient design and vast network of public transit reduces its environmental impact, and demonstrates that in some cases, smart urban policies can reduce resource use, even in the face of rising GDP and exploding populations.

Tokyo has also aggressively addressed leaky pipes, a strategy that has reduced water losses to 3 per cent. This compares to over 50 per cent leakage in cities like Rio de Janiero and Sao Paolo.

"These are places that are really short of water, and yet they're leaking it away," said Kennedy.

While Kennedy and other researchers have studied resource use in big cities before, they have often been limited either by a small sample size or by a definition which did not include the entire metropolitan region. This new study is the first to capture detailed information from these 27 megacities.

The results suggest that as megacities proliferate, smart policy decisions can make a difference. "What we're talking about are not short-term, one-election issues, but long-term policies on infrastructure that shape cities over years or decades," said Kennedy.

"The evidence is that megacities can make some progress in reducing overall resource use, and that's encouraging."

Where does your electricity come from?

Where you live could mean "greener" alternatives do more harm than good

Whether it's swapping your car for an electric vehicle, or your natural gas furnace for geothermal heating, transitioning from fossil fuels to electric-powered technology is widely believed to be the best way to lower carbon emissions.

But according to U of T civil engineer Chris Kennedy (CivE), knowing where the electricity comes from to power those "eco-alternatives" is critical.

If that electricity comes from burning oil and coal, it might mean that green alternatives aren't that green after all.

Kennedy's study, published in the journal Nature Climate Change, proposes a new decision-making threshold for when to move from fossil fuel technology to electric power (called electrification), and at what point that move may increase or lower carbon emissions.

Although regions may welcome "green" technology like electric vehicles, high-speed rail and geothermal heating, they aren't green if the electricity to power them creates even more carbon emissions than their oil-driven counterparts.

For electrification to lower emissions, Kennedy says that a region needs to produce its electricity at a rate below his threshold: approximately 600 tons of carbon dioxide equivalent per gigawatt hour (GWh).

This means that for every gigawatt hour of electricity generated (the power needed to run about 100 homes for a year), less than 600 tons of greenhouses gases (measured as "CO2 equivalent") can be emitted.

If a region's electricity production exceeds this 600-ton threshold, such as in countries like India, Australia and China (as shown below in Figure A), electrification could actually increase carbon emissions and accelerate climate change.

Countries such as these generate much of their electricity using coal, which he says produces about 1,000 tons of CO2 equivalent per GWh—nearly double the suggested threshold.

Natural gas, on the other hand, produces 600 tons, and hydropower and nuclear energy produce nearly zero.

"You could speculate that incorporating electrified technologies such as high speed rail in China may not lower overall emissions," says Kennedy. "It might even be more carbon friendly to fly."

Kennedy employed an industrial ecology approach to dig into the data from four previous studies—including one from the International Energy Agency and others from Canada, the U.S. and countries in Europe.

As a nation, Canada's electricity does not produce very much carbon in comparison to other regions.

It ranks low on the list, at just under 200 tons of CO2 e quivalent per GWh. "Despite that many believe our power is generated using fossil fuels from Alberta, most of Canada's electricity mix comes from hydropower and nuclear facilities," Kennedy says.

But when he zoomed in on certain regions in Canada, some of this good news changed. In a previous study, he compared the use of "green" geothermal heat pumps (used in homes) versus natural gas furnaces across different provinces.

He found that the pumps were more eco-friendly in Ontario and British Columbia—owing to nuclear and hydropower—but in coal-dependent Alberta, it was greener to stay with a natural gas furnace.

In his recent paper, Kennedy also cites a study that found using plug-in electric vehicles emitted less carbon when used along the west coast of the United States, but produced the same, if not more, carbon when used in the Midwestern U.S.

Right: Professor Chris Kennedy proposes a new 600-ton threshold that could indicate when switching to "green" alternatives may actually increase overall carbon emissions (pictured with PhD student Lorraine Sugar) (Photo: Roberta Baker).

Below: Which is the lowest carbon alternative? That may depend where you live.

Why does this threshold matter?

"Looking at overall carbon emissions of one country or a group of countries can only get you so far," says civil engineering PhD student Lorraine Sugar (CivE MASc 1To, PhD 1T8), who worked as a climate change specialist for the World Bank for nearly five years.

"It's hard to track progress and set goals internationally, while holding regions accountable. Having a specific and measurable target like this threshold is incredibly important, especially leading into the United Nations Climate Change Conference in Paris later this year."

According to Kennedy, this threshold puts a marker down in a policy arena where none has existed before—and it isn't just valuable for government.

"It reframes part of the climate change debate by encouraging individuals around the world to better understand where their electricity is coming from before they adopt supposedly eco-friendly technologies," he says.

"And even more, it incites them to understand how much carbon is emitted during the entire life cycle of those technologies—from their ongoing operation to their manufacture and disposal."

He recommends people search for their local government energy agencies to find out how electricity is generated.

If it is largely coal, then electric-powered technologies like ground-source heat pumps or electric vehicles may not be the most eco-friendly alternatives. On the national and international stage, he hopes governments do the same research when developing environmental policies and incentives.

"Canada's three largest cities—Toronto, Montreal and Vancouver—have some of the lowest carbon emissions from electricity generation in the world," says Daniel Hoornweg (CivE PhD), an associate professor at the University of Ontario Institute of Technology and a current U of T engineering PhD student.

"This threshold helps politicians make smarter energy decisions," says Hoornweg, who recently retired from the World Bank after nearly 20 years in the urban sector.

"Why aren't we making better use of these advantages to electrify our transportation modes? And why are we so focused on one or two energy projects (like a pipeline) instead of working on a more comprehensive U.S.-Canada energy agreement that could better leverage our energy strengths?"

Left: Nicole D'Mello, Year 4 CivE + PEY
Right: Ivan Damnjanovic, Year 4 CivE + PEY

Cressy Awards

IVAN DAMNJANOVIC AND NICOLE D'MELLO RECEIVE ANNUAL PRIZE FOR OUTSTANDING CONTRIBUTIONS TO UNIVERSITY OF TORONTO CAMPUS LIFE

Sixteen U of T Engineering students were celebrated at the 2015 Gordon Cressy Student Leadership Awards on Thursday, April 16. A ceremony to honour the recipients was held at Convocation Hall. Among the winners were two students from the Department of Civil Engineering

The prestigious award was established in 1994 and is named after Gordon Cressy, former U of T vice-president of development and university relations. It recognizes students who have made outstanding extra-curricular contributions to their college, faculty or school, or to the wider university.

"We are tremendously proud of our Cressy Award winners for their leadership and contributions to our Engineering community," said Dean Cristina Amon.

"We strive for excellence in the student experience and these students help us realize that goal through their leadership in co- and extra-curricular activities. Their engagement beyond the classroom enriches experiential learning for all students. With their broad perspectives, talent and potential, they are well-positioned to be the global engineering leaders of the future."

Ivan Damnjanovic (Year 4 CivE + PEY)

Ivan is one of civil engineering's top leaders. As a volunteer consultant with not-for-profit group Local Food Plus, Ivan helped secure the $150,000 funding required to launch a pilot program in support of food security. As the director of business development with the NSPIRE Innovation Network, he collaborated with industry professionals to grow the 2015 National Business and Technology Conference. He also founded and grew the Canadian Society for Civil Engineering at U of T into Canada's largest student chapter with over 200 members.

Nicole D'Mello (Year 4 CivE + PEY)

Nicole has a long list of impressive leadership accomplishments from her years at U of T Engineering.

She made it a priority to enrich the student experience through social events, and her enthusiasm for life and learning—both inside and outside of the classroom—was inspiring to many. She was director of both the Cannonball and Gradball formals, and the hospitality director for the Canadian National Concrete Canoe Competition. She was also a fourth-year civil engineering class representative for the Engineering Society and the co-founder of the Indian Engineering Students' Association.

U of T Engineering celebrates record number of women in first year

Women now account for 30.6 per cent of first-year students in U of T Engineering programs: a record for the Faculty and a number that surpasses all other Ontario universities.

It is the only engineering school in Ontario with female first-year enrolment of more than 30 per cent. National figures are expected later this year from Engineers Canada.

"U of T Engineering is a rich environment for talented, bright women to become engineering leaders," said Dean Cristina Amon. "Diverse perspectives are the foundation of our culture of excellence in education."

"It's exhilarating to be part of such a diverse and talented student community," said Teresa Nguyen (CivE 1T4 + PEY), a fourth-year civil engineering student and president of the Faculty's Engineering Society (which elected its first female president in 1975). "At U of T Engineering, it doesn't matter what your background is—it's about the ideas, expertise and reasoning you bring to the table."

Photo: Sasha Gollish, PhD Candidate, varsity track athlete and Pan Am Games hopeful.

Pan Am / Parapan Am Games

SASHA GOLLISH, PHD CANDIDATE IS RANKED 6TH IN THE WORLD FOR THE 1000m TRACK

Sasha Gollish is not a superstitious person. But the Pan Am hopeful wasn't feeling particularly inspired to run the 1000m on Friday the 13 at the Spire Invitational meet in February.

"I said to my coaches, Ross Ristuccia and Carl Georgevski, 'I don't feel well. I feel so heavy and slow.'"

With a little coaxing, Gollish laced up and went on to deliver the 2014-15 performance she's most proud of: a time of 2:39.70, which set a meet record and ranked her sixth in the world.

This remarkable time was just one of a series of other standout finishes that helped to take the Blues women's track team to the top of the CIS podium and earned Gollish the titles of both the CIS Female Track and Field Athlete of the Year and U of T Female Athlete of the Year for 2015.

"Sasha Gollish is a genuinely home grown University of Toronto developed student-athlete," says Georgevski.

"She started in our junior development track program back n 1996 and was rookie of the year as a first-year U of T student-athlete in 2000."

Gollish stands out among past winners of the athlete of the year honour because of the multiple and complex and demands she's met while racing.

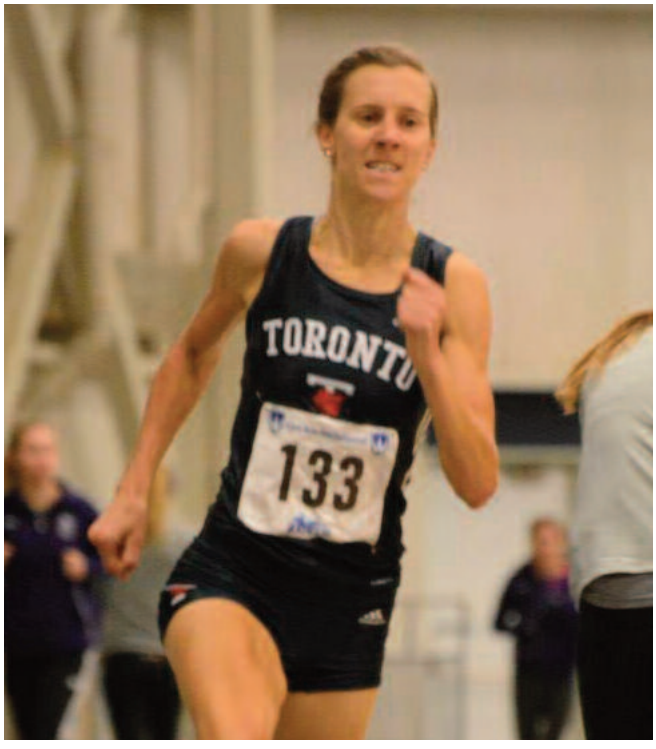
"I am an engineer by trade. The foundation of undergrad is learning how to multitask. I can work well this way."

She not only works well, but thrives with a full plate. A PhD student, Gollish works as an engineering consultant while studying engineering education at U of T – and is racing against students who are often 10 to 15 years her junior.

"Sasha is an extremely bright, talented and compassionate woman," Georgevski says. "From a coach's perspective she is the total package – a fierce competitor on the track and a true teammate and leader off the track."

"They keep me young," the 33-year old says of her teammates, with a light-hearted laugh.

"Things have changed between when I first competed and now – what matters most to me is different."



Over the years Gollish has fine-tuned what brings out her optimal performances.

For example, her school work and sessions at the gym suffer without adequate sleep, so she won't compromise on that; she is also very mindful of her diet. And beyond that, she's able to manage expectations and stress better.

"My perspective is different," she explains. "If I have a bad work out, for example, I get over it really quickly. Before, it would eat me up for a couple of days. I appreciate that I have more wisdom now."

Georgevski is confident that her experience and skills will take her to the next level.

"Here we are in 2015 and it's already been a big year; she is the CIS Female Track and Field Athlete of the Year, U of T Female Athlete of the Year and we're not done yet. We still have the Pan Am Games in her sights."

Gollish is currently in California racing to quality for the Toronto 2015 Pan Am/Parapan Am Games and the World Championships.

Like her track and field peers, she will know if she makes the cut in late June. For updates, check out her website at sashagollish.com.

Lassonde Mineral Engineering students explore Canadian Mineral Processing Conference

The two of us were fortunate enough to attend the 47th Annual Canadian Mineral Processors Conference in Ottawa, which was held from January 20th to the 22nd.

The CMP is an annual conference held in Ottawa that is attended by professionals in the Mineral Processing industry from around the world. The conference features a series of technical presentations on numerous aspects of mineral processing, including comminution, flotation, mill optimization and geometallurgy. In addition to the technical presentations, there are many networking events that occur during the conference.

As CMP Sponsored Students, we completed a number of volunteer tasks throughout the weekend, which included running the audio-visual system for the technical presentations, and assisting at the registration desk.

I volunteered at the registration desk on the first morning of the conference, so I was able to meet nearly all of the conference attendees. It was a great experience.

When we were not volunteering, we were able to attend many of the technical presentations offered at the conference. The technical presentations were very informative, since they presented advances in mineral processing technology ranging from early stage research to implementation at actual operations.

There was a mix of presentations by academics and industry professionals, which gave an overview of the state of the industry from multiple perspectives.

My personal favorite presentation involved studying the use of nanoparticles in the flotation of fine Pentlandite particles. Thomas' favorite was a presentation on implementing geometallurgy concepts in the evaluation of an early stage gold project.

In addition to the technical presentations, there were countless networking opportunities offered throughout the conference. On the first night, there was a student mixer – groups of students rotated through a series of tables where professionals from different sectors of the industry were sitting.

Photo: Thomas Bamford, MinE 1T4 + PEY visits Parliament Hill during CMP 2015.

We were able to speak to them about their experience, and ask any questions we had about the industry.

At this event alone, we were able to network with many industry professionals in a short amount of time. There were a number of other networking events over the remainder of the conference, including a beer and sandwich luncheon, and an awards banquet on the last night of the conference.

Not only were we able to network with professionals, but we were able to meet many other students from across Canada.

There were over 20 CMP Sponsored Students, as well as scholarship and technical award winners attending the conference.

We had a great time meeting the students from other schools; it was fun comparing our respective programs, and spending time with like-minded individuals.

Overall, we both had a great time at the conference. We were able to gain a better understanding of the technical advancements occurring in the mineral processing industry, and we had lots of fun spending time with industry professionals and other students attending the conference.

Matthew Visser
MinE 1T5

Thomas Bamford
MinE 1T4 + PEY

Photo: Gordon Dri, Year 3 CivE + PEY

PEY: What students and employers are saying

Each year, hundreds of students enrol in U of T Engineering's Professional Experience Year (PEY). While many universities offer co-op placements or four-month summer internships, PEY is different: it's a full-time job lasting one year or more. It is the largest paid internship program of its kind in Canada. In 2014-15, more than 720 students participated in PEY—the largest cohort in the program's 35-year history.

Employers include well-known international firms like Apple, Tesla Motors and IBM, as well as nimble start-ups in medical technology, social media and other emerging fields.

Despite their differences, all of these companies benefit enormously from the energy and fresh perspectives PEY participants. Their positive experience keeps them coming back, and many hiring managers maintain their ties with PEY as they move between companies; in some cases, those same hiring managers were once PEY students themselves.

"The PEY program interested me because it offered me a real-life experience of what I have learned in school for the past three years," said Gordon Dri (Year 3 CivE + PEY).

For Dri, who is enrolled in the Engineering Business minor, that means applying engineering techniques like data analysis to make corporate operations more efficient.

Dri is currently interning at Cadillac Fairview Corporation, Ltd., which owns, manages and operates commercial real estate across Canada. Working in the Operations department, he tracks various building metrics: everything from the average temperature and energy usage to the number of service calls.

He then synthesizes this data into reports and makes decisions about property management. For example, an increase in energy usage might indicate that certain equipment should be replaced, while a low number of service calls might be a selling point for potential tenants.

Dri aims to continue this type of work after graduation. "My future career plans are to work in analytics, leveraging big data to propel companies forward," he said. "In any industry or discipline, there are always problems to be solved. This is what engineering teaches you."

CAA: How one app could seriously change your commute

In 2011, CAA set up the CAA Graduate Scholarship in Transportation Engineering at the University of Toronto. Alec Knowles, MASc student and 2014 recipient of the scholarship, is working on a project that aims to make transit more efficient.

The goal of Alec's research is to create a web-based tool and a mobile app that will allow a transit agency to plot bus routes on Google Maps, and then (virtually) add/delete stops to see how much time this would cost/save the bus and its passengers, based on historical patterns.

"If the data shows that hardly anyone takes the No. 651 bus on Tuesday mornings, why are buses arriving every five minutes?" Alec asks. "Wouldn't it make more sense to have buses come every 10 minutes, and transfer the spare buses to another route which is overloaded? Of course, transit agencies already put a great deal of effort into making sure the No. 651 scenario above happens as infrequently as possible. What we are trying to do is reduce the time and effort required for this sort of decision making, while increasing its accuracy."

Read CAA's full blog post at blog.caasco.com/community/heres-how-one-app-could-seriously-change-your-commute/

What are they building in there?

THE LARGEST CONCRETE SPECIMEN EVER TESTED IN OUR STRUCTURES LAB AND THE STATE OF THE ART IN SHEAR DESIGN

As part of research on the shear strength of very thick one-way slabs, we have constructed a reinforced concrete "slab strip" specimen four metres in overall depth and about 20 metres long.

The specimen was cast on the morning of April 27th, 2015 and involved three truckloads of concrete (one per hour) for a total volume of 21 cubic metres.

In the photograph to the right, taken May 6, the forms have been removed from the front (South) face and the marks left by the prefabricated forms and the holes from the form ties are clearly visible.

The East end of the specimen is "cut back" so that it fits under the classrooms which are above this end of the laboratory.

For the concrete trucks, the seven day strengths were 27, 32, and 31 MPa for bottom, middle, and top layers, while on May 11th the 14 day strengths were 33, 37, and 37 MPa for these three layers.

We estimate that when the testing of the specimen commences in June, the concrete strength should reach about 40 MPa.

The figure to the right summarizes specimen geometry, reinforcement, loading arrangements and material properties. The density of the concrete at 14 days is 23.8 kN/m^3. Note that the percentage of flexural tension reinforcement is 9 x 700/(250 x 3840) = 0.656%. There is no shear reinforcement in the East 12m long shear span, while in the West 7m long shear span the amount of shear reinforcement is 300 x 522 / (250 x 1500) = 0.418 MPa. The nine longitudinal flexural tension bars and the five vertical bars used as shear reinforcement are all anchored with forged heads at their two ends. In addition the longitudinal tension bars have full-strength tapered threaded splices 1.43 metres to the east of the centre line of the load.

We invite those of you interested in the current state-of-the-art in shear design to send us your predictions for some or all of the values below:

1) The value of the applied jack load, P, which in addition to the self-weight of the specimen will cause failure.

2) The location where failure will occur.

3) If the East shear span of the slab strip contained the same shear reinforcement as that in the West shear span, what

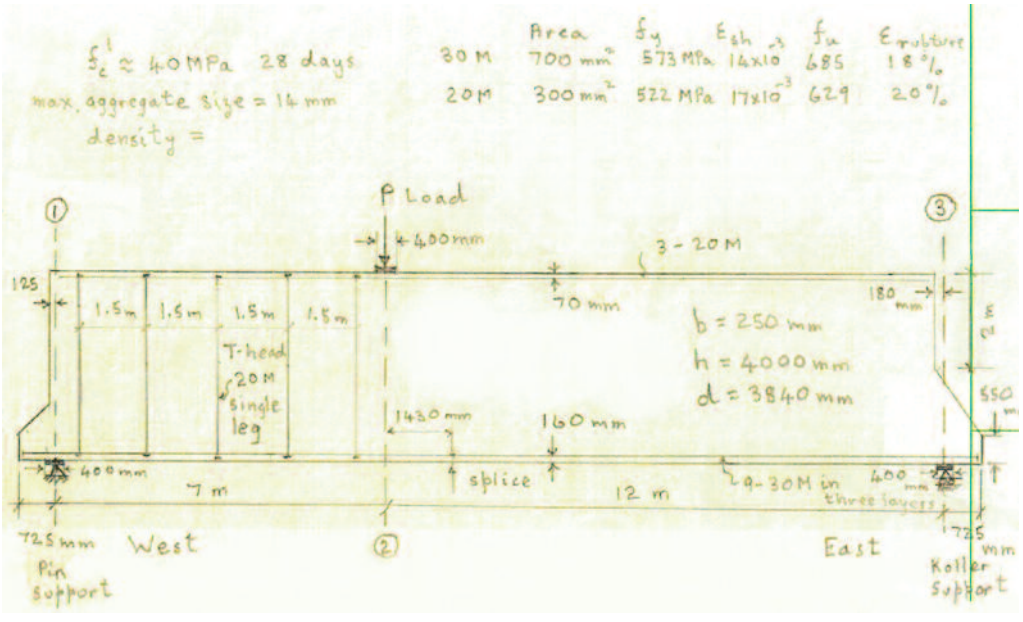
Photo: You're not seeing double. The panoramic photography method used to capture this massive cast specimen also captured MASc student Phil Quach (CivE 1T3) working on his project in two different places.

Below: Concrete specimen with forms removed.

would be the value of the applied jack load, P, which would cause failure?

4) For the actual specimen, what will be the values for the downwards deflection of the bottom face of the specimen on line 2 when the jack load is at 0.25, 0.50, 0.75, and 1.00 of the predicted failure value given in 1).

Send your predictions to Prof. Evan Bentz at bentz@civ.utoronto.ca to take part. Thank you in advance for your interest!



Paige Clarke Wins 2014-15 Vale Undergraduate Engineering Scholarship

Paige Clarke is a volunteer, a leader in her community and an ambassador for the engineering profession. She is also one of three recipients of this year's Vale Undergraduate Engineering Scholarships, selected from applications across Canada.

This is the second consecutive year that a Lassonde Mineral Engineering Program student has taken home a prestigious $10,000 scholarship, which is awarded annually to the most promising women in an accredited undergraduate engineering program in Canada who are interested in the mining and metallurgical fields. Romy Done, MinE 1T7, was one of last year's recipients.

All three recipients are actively involved in their communities, volunteer many hours to helping others and are strong role models for the mining engineering profession.

Clarke's passion for community outreach makes her an exemplary ambassador, which is demonstrated through her continued volunteer work with the local Community Living Organization which works with those with developmental disabilities.

Being a northerner and through her engineering studies, Paige has developed an interest in the relationship between First Nations communities and mining operations and hopes to utilize her academic career to further a career in Aboriginal Affairs.

"The contrast of small town northern Ontario to now studying in Toronto has helped me become more aware of the lack of knowledge and awareness supplied to high school students about opportunities for engineering careers in the mining and metallurgic industry. I look forward to continuing to be a strong advocate for women in mining and engineering." says Ms. Clarke.

Since 1990, the Canadian Engineering Memorial Foundation has promoted engineering as a career choice for young Canadian women through its extensive scholarship program.

As a condition of winning, recipients are expected to complete further outreach to high school students on the possibilities of a career in engineering.

Vale was a founding partner with the Foundation and it is through Vale's support these two important scholarships are available.

"Vale is committed to building a better future – investing in this scholarship is just one of the many ways we promote higher education and the career possibilities in the mining industry," said Tracy Aitchison, General Manager Human Resources at Vale.

"On behalf of the leadership team at Vale, I extend sincere congratulations to this year's recipients."

Along with the financial support, Vale may also offer a summer job opportunity to its scholarship winners.

Thanks to Vale's support, Paige will receive her scholarship certificates at the CEMF Networking and Award Event held in conjunction with the Engineers Canada AGM.

CEMF is committed to creating a world where engineering meets the needs and challenges of society by engaging the skills and talents of both women and men alike.

To that end, we are dedicated to attracting women to the engineering profession so they may fully contribute to the development of our society. In so doing, they honour the memory of the 14 women from L' École Polytechnique whose contributions to Canada ended on December 6, 1989.

Photos: Paige Clarke, Second Year MinE.
Across: Samantha Espley, GeoE 8T8. David King, CivE 1T3, Sivakrishna Srikukenthiran, CivE 0T7, and Prof. Amer Shalaby receive the Millar Best Paper Award.

GeoE 8T8 Engineer Honoured by Engineers Canada

Samantha Espley, a Geo E 8T8 alumna who has become a leading mining executive, is among those being honoured by this year's Engineers Canada awards.

Espley received the Award for the Support of Women in the Engineering Profession for her engineering excellence and outstanding support of women in the engineering field.

"Samantha Espley is a remarkable example of how U of T engineers pursue excellence," said Dean Cristina Amon. "Not only is she an expert in her field, but she also continues to encourage innovation, entrepreneurship and diversity in the next generation of engineering leaders. On behalf of the Faculty, I extend my heartfelt congratulations to Samantha and express my gratitude to Engineers Canada for recognizing these valuable contributions."

Since completing her degree at U of T Engineering, Samantha Espley has moved quickly through roles of increasing responsibility at Vale (formerly Inco) and previously with Glencore (formerly Falconbridge).

She is currently general manager of the Mines and Mills Technical Services Department in Vale's Ontario Operations, leading a multidisciplinary group of more than 200 engineers,
geologists, metallurgists and technologists. She has also published and presented over 60 papers, reports and publications, with topics ranging from underground mine designs and automation systems to the role of women in the mining industry.

Espley is a founding member of Women in Science and Engineering (WISE) and has held leadership roles with WISE, the Canadian Institute of Mining and Metallurgy (CIM), Professional Engineers Ontario (PEO) and the Canadian Mining Research Network (CAMIRO).

She has been a keynote speaker at numerous events, such as the Ontario-wide university initiative Go Eng Girl (for young women in grades seven to 10), WISE Gearing Up sessions (for high school students), Science North and WISE Fireball events, as well as Science Olympics (for girls in grades four to eight) and PEO Job Shadowing events.

In recognition of her achievements and contributions to the engineering profession, Espley has received the International Women's Week Award, the CIM Distinguished Service Medal, the U of T Engineering 2T5 Mid-Career Award and the Trailblazer Award from Women in Mining Canada.

Millar Best Paper Award

TRANSPORTATION RESEARCHERS WIN FOR SUBWAY CROWD ANALYSIS

The Transportation Research Board of the National Academies has awarded David King (CivE 1T3 and MASc Candidate), Sivakrishna Srikukenthiran (CivE 0T7 and PhD Candidate), and Prof. Amer Shalaby with the annual William Millar Award for their outstanding paper entitled, "Using MassMotion to Analyze Crowd Congestion and Mitigation Measures at Interchange Subway Stations: Case of Bloor–Yonge Station in Toronto, Canada."

The William Millar Award for best paper dealing with public transportation was instituted in 2012 in honor of William Millar, who served as the 1992 TRB Executive Committee Chair; TRB Executive Committee member from 1987 to 1995, and 1996 to 2011; Chair of the TRB panel that provided the rationale and blueprint for the Transit Cooperative Research Program; and President of the American Public Transportation Association from 1996 to 2011.

Award winners are identified and selected by a committee of TRB members from around the world.

King, Srikukenthiran, and Shalaby work in the University of Toronto Transportation Research Institute. For more information on this research and other research activities at UTTRI, please visit uttri.utoronto.ca.

Meet Nancy Hill, CivE 8T1

SKULE ALUMNA NANCY HILL MAY WORK IN INTELLECTUAL PROPERTY, BUT SHE IS VERY MUC

As a patent agent, trademark agent, lawyer and founding member of the patent and trademark agency firm Hill & Schumacher, Hill manages international portfolios of patents, trademarks and design works for clients ranging from start-up businesses to universities.

She regularly draws upon her engineering background while drafting patents in a wide variety of areas including robotics, mechanical devices, software, chemical processes, microfluidics and electromagnetic devices.

Hill also contributes her time to the engineering community in many significant ways, including as a member of the Engineering Alumni Association (EAA) Honours and Awards Committee at U of T, a warden of Camp 1 for the Ritual of the Calling of an Engineer and as a long-standing volunteer for a variety of committees at Professional Engineers Ontario (PEO).

U of T Engineering's Jamie Hunter recently spoke to Hill about her law career, volunteerism and her accomplishments at PEO.

Why did you decide to pursue a career in law instead of engineering?

The career I've chosen is very much a combination of the two. I'm very much a part of the knowledge-based economy so the majority of my clients are engineers.

On a daily basis, I try to figure out how new inventions work so I can describe them and claim them in words. I feel very much like I am building on my engineering background, while combining it with the law.

Was that your career plan all along?

When I went into engineering, I explored other things and talked to other people, including a few lawyers. My dad was an adjunct professor at U of T in the Faculty of Medicine and had worked with engineers.

He had a fellowship student who had been a mechanical engineer, so Dad hoped that I would go from engineering into medicine as opposed to engineering into law.

After graduating from U of T Engineering, I worked as an engineering consultant for two years before going to law school.

I think the reality was that I had more schooling in me and was generally interested in the law. I think it's a good fit for me. I like the language and I'm intrigued by it. Being in patent law is the perfect fit.

What is the most important thing you took away from your engineering degree?

Ultimately, it's the ability to figure things out and the confidence of knowing that I will be able to figure things out. I deal with a broad range of engineering disciplines, so when confronted with a new invention—although I may not know anything about the field—my engineering background gives me the self-confidence to know that I'll be able to understand it as long as I'm given enough information.

Is there a U of T Engineering alumna/alumnus/professor that inspired you to stay involved with Skule™?

I served on a committee with Sonia De Buglio (ChemE 9T4) [Director of Alumni Relations at U of T Engineering] and she got me into volunteering more at U of T. I have served on some committees with Jane Phillips (ChemE 5T3) and Barbara McCann, who both inspired me. Early on in my career, I taught a course at U of T's School of Continuing Studies on patenting and intellectual property. That influenced me to get involved as well.

As an alumna, what has been the most rewarding aspect of your involvement with U of T?

Seeing the young people. I was at the EAA Awards ceremony recently and I was sitting beside a young student, and he was so impressive and enthusiastic. For the past two years I've also attended the Entrepreneurship Hatchery's Demo Day (Hill & Schumacher provides a bursary). I'm very impressed with The Hatchery initiative—it's a great opportunity for students to explore their entrepreneurial mindset. I find that quite inspiring.

Since you became involved as a volunteer at U of T Engineering, have you seen an increase in the number of young alumni volunteering?

I think it's wonderful that U of T Engineering is finding ways to attract young alumni to volunteer. I think it's difficult for recent alumni to juggle young families and their

Photo: Nancy Hill, CivE 8T1

H AN ENGINEER AT HEART

careers and volunteer. But they do, and I think it speaks a lot about U of T Engineering that young alumni are willing to give their time back to the University.

Can you expand upon your volunteer role as chair of the Women in Engineering Advisory Committee at PEO?

I did that quite a while ago [1995-1998] but we had a very significant breakthrough when I was chair. We convinced PEO to amend the Professional Engineers Act to include harassment as a part of professional misconduct.

In doing so, PEO was the first professional engineering organization in Canada to do that. We were seen very much as the leader, and it was great to be a part of that. But it was a challenge—it took us nearly 10 years.

We did a national survey and we were able to demonstrate that both men and women thought it was important to include harassment, and that was critical in our being able to move forward.

We also set up a Guideline on Human Rights in Professional Practice, which provided information for the engineering community in terms of how to handle equity and diversity issues.

We felt it was important not only to have the act changed but to also provide tools.

U of T Engineering celebrated a record-number of female first-year students this year. Can you comment on the importance of this milestone to the profession?

I think it's important that we attract women to engineering. Having a female dean has made a huge difference and I think she's really supported women within the Faculty, which is fabulous.

I think women represent around 10 per cent [specifically 11.7 per cent according to Engineers Canada] of all licensed engineers—not very high when you consider that we represent approximately 50 per cent of the population.

The universities are the pipeline to increasing the numbers of licensed female engineers.

Two New Professors

MARIANNE HATZOPOULOU AND MASON GHAFGHAZI JOIN US THIS SUMMER

The Department of Civil Engineering is excited to welcome two new professors to our ranks this summer.

Prof. Marianne Hatzopoulou is an expert in modelling and simulation and will join the Transportation Engineering and Planning Research Group and the University of Toronto Transportation Research Institute. Her research bridges transportation and environmental issues.

Prof. Mason Ghafghazi has eight years of experience working as a geotechnical engineer. His research is focused on creating models that can better compute the response of non-classic geomaterials such as widely graded soils, low-plasticity clays and silts.

Look for full profiles of their exciting research work on our website and in the next issue of the Civilian.

Prof. Emeritus Peter Birkemoe Receives Lifetime Achievement Award

AISC LIFETIME ACHIEVEMENT AWARD ANNOUNCED AT NASCC: THE STEEL CONFERENCE

On March 25, eleven industry superstars received awards from the American Institute of Steel Construction (AISC) at the 2015 NASCC: The Steel Conference at Music City Center in Nashville.

Among them was Prof. Emeritus Peter Birkemoe, who was honored for his exceptional contributions to the advancement of structural steel design and the construction industry.

AISC's Lifetime Achievement Award honors individuals who have made a difference in the structural steel industry's success and recognizes their outstanding service over a sustained period of years to AISC and the structural steel design/construction/academic community.

Birkemoe is a renowned researcher and authority on bolted and welded connections, with emphasis on practice-oriented results for design engineers and construction practice.

He has made extensive contributions to the research on which the industry bases the design of bolted connections and was involved with the original research that resulted in the discovery of block shear.

His experimental and analytical investigations on the behavior of hollow structural sections (HSS) members led to the special strength classification for manufactured cold-formed, heat-treated tubular members.

His other stability research includes the examination of safety of curved bridges during construction and the study of sustained plastic deformation beyond development of full-yield properties.

He joined the University of Toronto's Department of Civil Engineering in 1973 and continues to teach and apply his unique knowledge and vast experience with steel connections as a consultant.

Photo: Prof. Emeritus Peter Birkemoe.

$20M for smart computing

OPENS HIGH-PERFORMANCE COMPUTING CONSORTIUM TO NEW RESEARCH AREAS

A $20 million investment from the federal government announced recently will enable the Southern Ontario Smart Computing Innovation Platform (SOSCIP) consortium to add new areas of focus—such as advanced manufacturing and cybersecurity—to its research projects.

U of T is a founding member of SOSCIP, created in 2012 to support collaboration between academic researchers and industries using advanced computing and big data analytics.

SOSCIP was founded with a focus on research into five core areas—cities, health, energy, water and advanced computing. Using state-of-the art technology, such as the IBM BlueGene/Q (the fastest supercomputer in Canada), research has progressed by way of scientists such as U of T Engineering Professor Eric Miller (CivE), who is analyzing urban transportation and Professor Richard Peltier, who is investigating climate change.

Photo: Prof. Constantin Christopoulos

Smarter cities for India

U OF T ENGINEERING PROFESSORS BUILD NEW PARTNERSHIPS

Four Engineering professors travelled to India with U of T president Meric Gertler earlier this year to discuss Prime Minister Narendra Modi's plan to build 100 smart cities in his country.

"I think Prime Minister Modi's decision to spearhead the development through the idea of smart cities is breathtaking and it is inspiring," U of T President Meric Gertler said in a recent interview with an Indian news service.

Professors Stewart Aitchison (ECE), Yu-Ling Cheng (ChemE), Constantin Christopoulos (CivE) and Mark Fox (MIE) participated in a roundtable on sustainable urbanization at the Indian Institute of Technology-Bombay, visited think tanks and foundations, and met with government officials in Mumbai and Delhi.

But defining a "smart city" is not always easy, said Fox.

"What it means for a city to be smart depends upon what service you're focusing on and how efficient and effective you are at providing it. You may be interested in transportation. Or you can be smart from a garbage perspective where a smart city means that you do a better job of recycling and separating and stuff like that. So being smart can occur in many different areas within the city."

India's proposed smart cities will probably all be "smart" in different ways, said Fox.

"I presume there will be a baseline that will be the same across all the cities, but that each city will excel in certain areas. Some may be excellent from a transportation point of view, others in terms of sanitation, or housing, et cetera."

Christopoulos, a civil engineering professor, said his Indian counterparts were very interested in his particular area of expertise – the resilience of infrastructure. Structural resilience is important to cities such as Mumbai, which is located in both an earthquake and flood zone, he said.

"If India plans to build 100 smart cities, that's a lot of buildings and a lot of people. You'll want those buildings to be resilient, to be able to survive natural disasters."

The smart city wasn't the only agenda item for the trip. At meetings at the Tata Institute of Social Sciences and the Observer Research Foundation (ORF), Indian officials wanted to learn more about a new U of T initiative called the Centre for Social Services Engineering, Fox says. India has more than one million non-governmental organizations and the Tata Trusts and the ORF are concerned that with so many NGOs, social services are being delivered inefficiently with much duplication and missed opportunities, he said.

Both Fox and Christopoulos said U of T researchers and their Indian colleagues are just beginning to explore the potential of collaboration. "There's strong interest from the Indian side in working with U of T in the area of smart cities," Fox said.

"We took a number of promising first steps," said Christopoulos. "Now we need to continue to work on the areas of mutual interest."

Read more about Canadian scholars studying innovation in India and U of T's India Innovation Institute at munkschool.utoronto.ca/program/india-innovation-institute/

Coming Events

Ninth Annual CAMP Reunion

Saturday, September 12th 2015

Gull Lake CAMP, Minden
11:00 a.m. Reception and Lunch

Optional bus available from Toronto while space permits.

Ticket sales and registration:
www.civil.engineering.utoronto.ca/alumni

CIV-GEO-MIN Alumni Reception 2016

Friday, February 5th 2016

Faculty Club, University of Toronto
6:30 p.m. Reception, 7:40 p.m. Dinner

Ticket sales and registration:
www.civil.engineering.utoronto.ca/alumni

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Civil Engineering
UNIVERSITY OF TORONTO

Department of Civil Engineering
Faculty of Applied Science & Engineering
University of Toronto

Galbraith Building
Room 105 - 35 St. George Street
Toronto, Ontario, Canada M5S 1A4

Tel: 416.978.0945
Fax: 416.978.6813

www.civ.utoronto.ca