CONCORDIA ENGINEERING

NEWS

STUDENTS PROTOTYPING THEIR FUTURES

Université Concordia University

FACULTY OF ENGINEERING AND COMPUTER SCIENCE

INSIDE

Concordia Engineering News is published twice a year by the
Faculty of Engineering and Computer Science at Concordia University.

Editor: Laurence Miall
Design and Photography: University Communications Services
T14-19392
Submit all editorial and advertising inquiries to:
Concordia University
Faculty of Engineering and Computer Science
Communications Advisor, Sir George Williams Campus
1515 St. Catherine W., EV 002.280
Montreal, Quebec, Canada H3G 2W1

Email your feedback to laurence.miall@concordia.ca
Please visit our website: encs.concordia.ca

ON THE COVER:
Students Amy T.N. Ma, Keena Trowell, Yaz Khoury,
Venkata Lakshmi Mantha, Omer Khan, Mital Prajapati

MESSAGE FROM CHRISTOPHER TRUEMAN

INTERIM DEAN

My tenure as interim dean has been only a year, but in that time, some huge steps forward have been made by the Faculty. As the first days of genuine summer heat embrace our city, I'd like to reflect on some of the progress we've made that indicates a very bright future for us.

We will shortly be making an official announcement about the establishment of a new bachelor's degree in aerospace engineering. This is thanks to the collaboration of the Department of Mechanical and Industrial Engineering and the Department of Electrical and Computer Engineering. Aerospace is, of course, already of vital strategic importance to Concordia, and Montreal is a hub of the aerospace industry. With this new program, we continue to evolve in our ability to provide these aerospace manufacturers with top-notch engineering graduates who have the cutting-edge skills required in this multidisciplinary field.

In a very different domain, our new Global Engineering Initiative, which you can read about in detail on page 10, will further boost our longstanding strength in imparting to our students a good knowledge in the social implications of engineering projects. Indeed, training in this area goes well beyond simple knowledge — it provides transformative experiences that the students appreciate so much — and thanks to the generous support of Susan Raymer and Ben Wygodny, we can now offer more travel grants, more workshops, and more opportunities to collaborate with other universities around the world.

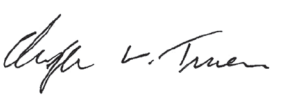
The focus of this edition of our newsletter is on our students. I want to recognize some fantastic work going on among some of the undergraduate associations. Women in Engineering has continued a partnership with Roslyn School here in Montreal, working with girls, in particular, on creative and instructive science projects, and fostering a generation of future women engineers. In a totally different gear, our student chapter of the Society of Automotive Engineers (SAE) has scored a big success by finishing first at the Student Exhibit Competition in the auto industry's World Congress and Exhibition in Detroit, with a presentation of their Supermileage project. Meanwhile, another award-winning student association, Space Concordia, competed in the second Canadian Satellite Design Challenge, and has expanded into other areas of activity, including rocketry, and building a Mars Rover.

All our students associations make me proud, with their palpable zeal for learning, building things, and reaching out to various communities — whether to "give back" and help others, or to learn the vital skills of securing industry support for their endeavours.

Of course, helping to open the doors for our great students are our many exceptional instructors, and I'm happy to report there has been no shortage of success among our faculty members lately. There are too many to list here, but I do want to acknowledge Amir Aghdam for being elected the president of the IEEE Canada. Aghdam was also inducted as a fellow in the Engineering Institute of Canada, as were Abdel Razik Sebak and Robin Drew.

The final piece of news I would like to report is that Concordia's search for a dean has concluded very successfully. As of August 1, 2014, the new dean will be Amir Asif, who comes to us from York University in Toronto. Asif holds a PhD and a Master of Science in Electrical and Computer Engineering from Carnegie Mellon University. He served as chair of York's Department of Electrical Engineering and Computer Science for seven years, building it from a classic computer science department into the large multidisciplinary unit, the very core of the Lassonde School of Engineering, that it is today. I am delighted to be welcome him to Concordia — and Montreal — and I wish him every success.

I hope you enjoy this edition of Concordia Engineering News. Enjoy the summer!



Christopher Trueman, PhD
Interim Dean and Professor
Faculty of Engineering and Computer Science

FACULTY NEWS HIGHLIGHTS

On **January 8, 2014**, the Concordia Institute for Aerospace Design and Innovation (CIADI) hosted an exciting duo of guest lecturers, Todd Reichert and Cameron Robertson, alumni of the University of Toronto Institute for Aerospace Studies. Their presentation, "Doing More with Less: Human Flight on the Power of a Cordless Drill," chronicled their success in designing and building the AeroVelo Atlas human-powered helicopter, which in 2013 captured the American Helicopter Society's Sikorsky Prize. For over 30 years, teams from across the world had attempted but never achieved this feat. The public presentation was the first of many such events CIADI plans to help bring the public into the fascinating world of aerospace.

Amir Aghdam and Abdel Razik Sebak from the Department of Electrical and Computer Engineering and Robin Drew from the Department of Mechanical and Industrial Engineering have become fellows of the Engineering Institute of Canada (EIC). The announcement was made **January 10, 2014**. This year the EIC recognized 25 individuals who have made "outstanding achievement or service to the engineering profession." including the astronaut, Chris Hadfield, who was made an honorary member.

Amir Aghdam has also been elected to the position of President of the IEEE Canada for the 2014/2015 year.

The Engineering and Computer Science Association hosted a very successful Engineering Week, **February 24 to March 1, 2014**. Highlights included a presentation from the CBC's Bob McDonald of "Quirks and Quarks" and the 30th anniversary edition of the Troitsky Bridge Building Competition. Soon afterward, the Faculty hosted Global Engineering Week, **March 10 to 14, 2014**, organized by the Concordia student chapter of Engineers Without Borders. Among the numerous activities were a visit from Marc Garneau, MP, to discuss the role scientists and engineers play in government.

The "Ice Runner" was one of many final year Capstone projects that undergraduate students presented in the spring of 2014.

MIAO SONG

Computer scientists Miao Song and Serguei Mokhov, affiliate assistant professors and part-time faculty members, expanded on Song's doctoral research creation, the Illimitable Space System (ISS) for use in the play, Like Shadows, staged at China's prestigious Central Academy of Drama in Beijing, April 2014. ISS uses a motion-sensitive Kinect camera in a theatrical context that allows for the collection of data about the movements of actors, dancers or other performers; that data is then fed into a computer and translated into arresting graphic imagery.

Faculty research was featured not once, but twice, during the spring on the Télé-Québec science show, Le Code Chastenay. The first show, aired **March 18, 2014**, was filmed in the wind tunnel, a research laboratory directed by Ted Stathopoulos from the Department of Building, Civil and Environmental Engineering. The segment also featured PhD student, Mauricio Chavez. The second Télé-Québec show was filmed in the environmental chamber and featured the students of Paul Fazio: Ahmad Kayello and Daniel Baril. This original television segment was broadcast **March 25, 2014**.

On **April 8, 2014**, Concordia's student chapter of the SAE and its Supermileage project clinched first place in the prestigious Student Exhibit Competition. The Society of Automotive Engineers (SAE) World Congress and Exhibition in Detroit, Michigan is one of the biggest car industry events of the year. See full story on page 14.

The District 3 Centre for Entrepreneurship and Innovation, headquartered in the Faculty, has played a part in securing a big win for a multidisciplinary team of Concordia and McGill students. The team — Al-Hurr Al-Dalli and Charles Gedeon from Concordia, as well as recent McGill graduate Sami Sayegh Sayegh — worked for many months on a proposed project called Skywells — large sail-like structures with a hydrophobic coating to collect dew that forms during the night. This would be an innovative water-generating technique that could be particularly well-suited to arid climates. The team drew on the expertise of Xavier-Henri Hervé, founder of District 3, in crafting a pitch that won the Best Presentation Award at the Shell Ideas360 Competition in Amsterdam, Netherlands. The following day, **May 15, 2014,** their project won the Main Prize. They were the only team from North America among five finalists.

Space Concordia's entry into the second Canadian Satellite Design Challenge was featured in The Globe and Mail, **March 4, 2014**. The team finished among the finalists at the ultimate phase of the competition, hosted by the Canadian Space Agency's David Florida Laboratory in Ottawa, **May 27-29, 2014** and won second place overall.

Rolf Wüthrich, associate professor in the Department of Mechanical and Industrial Engineering, and his research team won first prize at the business case competition, held during the 82nd International Congress of Acfas (Association canadienne-française pour l'avancement des sciences), which this year was hosted by Concordia, **May 12-16, 2014**. Wüthrich's team developed an innovative catalyst for producing hydrogen, thanks to a patented electrochemical treatment. This innovation means that nickel electrodes—the industry standard—are rendered a lmost as efficient at production as when platinum is used as a catalyst.

Thanks to a generous gift of $125,000 from Susan Raymer, BA 71, and Ben Wygodny, BA 69, announced on **May 27, 2014**, Concordia is able to building on its traditional strengths in examining the social aspects of engineering through the new Global Engineering Initiative. The gift gives more opportunities to engineering students to learn about the demands on their profession in a global context. See the full story on page 10.

The Faculty of Engineering and Computer Science has produced a brand new promotional video to help with the recruitment of students from around the world. It first aired at the international forum of the American Society for Engineering Education, **June 15-18, 2014**, and is now available for viewing on the Concordia YouTube channel. The video promotes the Faculty's collegiality, diversity and numerous opportunities for hands-on learning.

CHELSEA POMERANTZ

THE PLAY OF THEORY AND PRACTICE

BY MALCOLM MCLEAN

For Chelsea Pomerantz, theoretical physics is a fascination, and mathematics a joy. In fact, theoretical physics opened the door to engineering.

When Concordia came recruiting to Marianopolis College, she asked about physics courses. "Martine Fachena [the Faculty's student recruitment officer] asked me if I had ever thought of engineering. All I could say to her was: what's engineering? I didn't know much about it. She said 'you like physics and you like math, engineering is basically applied physics and math.'"

Speaking rapidly and precisely, this third year electrical engineering student explains how engineering has turned out to be a very good direction for her: "She steered me in a very good direction. I like to learn the concepts and put them into practice."

Following a passion for astrophysics, in her first year, she joined Space Concordia's satellite team, which had entered the Canadian Satellite Design Challenge. Working with older students on ground tests of the power subsystem, she built a circuit to test the batteries that power the satellite. "Using simulation tools we had to design a circuit to test how the batteries would charge and discharge. Once it's in space you can't fix it, so you have to get it right."

"USING SIMULATION TOOLS WE HAD TO DESIGN A CIRCUIT TO TEST HOW THE BATTERIES WOULD CHARGE AND DISCHARGE. ONCE IT'S IN SPACE YOU CAN'T FIX IT, SO YOU HAVE TO GET IT RIGHT."

This year, in her 390 Design course, she was in one of the ten teams that took part in the Sumo Robot competition.

"That project was outstanding!" she exclaims. Her team of two electrical engineering students and two computer engineering students designed and built a fully autonomous robot. Engineer-in-residence Dmitry Rozhdestvenskiy, in the Department of Electrical and Computer Engineering, was overseeing the project. "If we wanted a part, he'd ask us about it. And if we couldn't answer he'd tell us to go learn it and come back in twenty-four hours. I wasn't really sure about that at the start, but what I know about robotics is because of his hard questions. He expected us to do it right. That meant learning fast."

Chelsea's team worked on that project for a full semester, from the budget to the battle of the robots. "On the electrical side we designed and assembled the hardware, sensors, how many wheels, how many and what kind of motors, the type of chassis, the wiring, etc. Our computer colleagues did acres of code."

On December 3, 2013, came the big day of battle for the Sumo robots. They were all put in in a ring, and the goal was to push opposing robots out of the ring. When a sensor broke,, their robot showed its robustness, continuing to function, avoiding the other robots and staying in the ring. "It still had a rear sensor, so it could avoid the attacking robots. It just couldn't see in front to attack them. Everything else worked consistently well."

This summer, engineering is opening the door to theoretical physics. Chelsea is heading for a dream job at TRIUMF, Canada's national laboratory for particle and nuclear physics in Vancouver.

DEVEN COLLETTE

"STEP OUT OF YOUR COMFORT ZONE"

BY MALCOLM MCLEAN

For Deven Collette, who finished his last year in software engineering in May, thinking big on his final year project — called a Capstone — paid off. His team of seven decided on a very ambitious project, called AUGMENTED, a mobile app for urban scavenger hunts. Using a smartphone, the players hunt down prizes that could range from free coffee to event tickets. They follow a graphic compass with a needle showing the direction and an idea of distance. The prizes are supplied by companies wishing to obtain visibility, and the game can bring foot traffic to a desired location, for example, to the door of a restaurant. It can also be used for geocaching activities.

When the time came to show off AUGMENTED, the team prepared a scavenger hunt scaled down to the atrium of the EV Building. The app turned out to be a big hit with users. "The people on the floor liked the idea, caught on quickly, and had fun."

Collette singled out his teammate Ramez Debbas for having the vision and contacts to launch this project. "At first he had trouble finding a team that would go along with his vision. But we're really glad we did." The team's external stakeholder was a mobile app development company called NVENTIVE. Located in Old Montreal, it has about 200 employees and is growing rapidly. François Tanguay, the President of NVENTIVE — who had the initial idea for the app — supported the project with encouragement, office space and access to expert opinion. Deven worked on the user interface. "I had a lot of useful discussion with UX [user experience] people at NVENTIVE."

When the project was over, five of the team members found jobs at NVENTIVE. "The project was a win all around. We got to learn from a very dynamic company how to do a project like this. They got to see us in action." Deven and his fellow new employees of NVENTIVE are hoping to do further work on the AUGMENTED app as part of their new tasks.

Collette, who grew up in the Montreal region, sees lots of opportunity for software engineers here. "This is a great city for software development." As a student at Concordia Engineering, he got involved with the Software and Computer Science Society (SCS) as VP Social. "We put a team together for the North America-wide CS Games (Computer Science Games) last year at Université de Laval and this year at ÉTS. This is an annual computer science competition that includes challenges in all aspects of computing. It was a lot of fun, we won 4th prize overall, and I made lots of new connections."

As he graduates, Collette's advice is to "step out of your comfort zone and try as many things as you can."

"THIS IS A GREAT CITY FOR SOFTWARE DEVELOPMENT."

EMILY GAN

EMILY GAN

NAVID SHARIFI

NO FEAR OF SUPERHYDROPHOBIC RESEARCH

BY MALCOLM MCLEAN

When Navid Sharifi arrived to start his PhD in Mechanical Engineering in January 2012, Concordia's Thermal Spray and Multiphase Flow Laboratories (TSMF) was just receiving new thermal spraying equipment, and he was one of the first to be trained to use it. He has seen the research group grow rapidly since that time. Concordia has recently emerged among the leading Canadian universities in the field, and hosts the Canada Research Chair-Tier 1 Thermal Spray and Surface Engineering, under Professor Christian Moreau, the Chair holder. And Sharifi is pursuing a whole new application for the thermal spraying technology.

Until now, the main application of thermal spraying has been to coat the parts of jet engines, creating thermal barriers that can withstand extreme conditions. Sharifi is exploring the possibility of applying it to create a superhydrophobic and durable coating for aircraft wings to solve a critical aeronautical issue: icing. If you're wondering what superhydrophobic means, just think "fear of water" — such surfaces are highly repellant of the world's most common liquid.

Navid attributes his passion for science — and its application to the real world to get results — to his early reading of Isaac Asimov. He came from Iran, where he earned a master's in materials science at Iran University of Science and Technology in 2009, and was a top-ranked student. He subsequently came to Montreal with his wife, Bahareh Goodarzi, who is also a PhD candidate at Concordia in the Faculty of Engineering and Computer Science. It was Ali Dolatabadi, associate professor in the Department of Mechanical and Industrial Engineering, who encouraged Sharifi to join the TSMF lab. Sharifi is grateful also for the ongoing encouragement of his co-supervisor, Martin Pugh — chair of the Department of Mechanical and Industrial Engineering.

Sharifi has flourished and earned distinction from and for his school. Last year, after winning the three-minute thesis contest — describing his research subject to a general, non-specialized audience — he used the travel money he was awarded to attend the International Thermal Spray Conference, in Pusan, South Korea. Concordia had a solid presence at the conference, with four papers presented, and Sharifi's won a best paper award. Now a respected participant in the global conversation on thermal spraying, Navid will be attending this year's conference in Barcelona. In 2014 he was awarded a Program Fellowship for Foreign Students by the Fonds de recherche du Québec — Nature et technologies.

The decision to leave Iran was hard, but after his last trip to Teheran, "when I came back to Montreal, I realized I was coming home." When Sharifi and his wife complete their Concordia engineering PhDs, the whole world will beckon with opportunity — places eager to put their great talents to use — but they would be happiest to use them at home in la belle province.

"WHEN I CAME BACK TO MONTREAL, I REALIZED I WAS COMING HOME."

STUDENTS PROTOTYPING THEIR FUTURES

Gump, a bipedal robot, is small, squat, and has a slightly shuffling gait. He is programmed to respond to verbal commands such as START, STOP, LEFT, RIGHT. There are more sophisticated robots in this world, sure, but few that better illustrate how engineering education is conducted in the 21st century. Dig into the story of Gump's creation and it is apparent that he is an exemplar of Concordia's commitment to what is sometimes called experiential learning. Teamwork on product-development projects gives students the professional edge in a world where graduates are expected to hit the ground running.

after the finishing stone that sits atop a built structure. The symbol is a fitting one, since Capstone projects are intended to be the culmination of engineering education — they unify a student's diverse skills and knowledge. The projects are a long-standing tradition of the Faculty, but it's only since 2002 that they have been a requirement for graduation. Since then, students' projects have become ever-more ambitious, and the different phases of the project are increasingly well-defined and academically demanding. In 2005, when the new Engineering and Visual Arts Complex was opened, the Faculty initiated poster presentations of

"WE WANT TO GIVE STUDENTS A PROJECT THAT IS LIKE SOMETHING THEY WOULD SEE IN INDUSTRY" — WILLIAM LYNCH

"We want to give students a project that is like something they would see in industry," says William Lynch, chair of the Department of Electrical and Computer Engineering, and someone who has seen how project work has evolved over the years at Concordia. "Out there in the real world, you don't sit three-hour exams. You are faced with projects."

Gump is just one of numerous projects called Capstones, undertaken by students in the final year of their undergraduate studies. Capstones are named

Capstone projects in the atrium. Walking through the Capstone poster session this spring, you could see an "ice runner," a sort of modified catamaran designed to travel on frozen lakes or snow, or a Mars Rover, designed to perform intricate operations in space, or, of course, Gump the robot.

The Capstone poster session does more than simply give passersby exceptionally cool gadgets and devices to behold. It empowers students to demonstrate the utility of their products to a general audience.

GUMP — CAPSTONE TEAM MEMBERS
Venkata Lakshmi Mantha, software recognition, Omer Khan, software — microcontroller, interface between speech and robot, Mital Prajapati, hardware — PCB building, design, Yaz Khoury, hardware, mechanical, bipedal design and building, Supervisors: Wei Ping Zhu and Sujan Kumar Roy

ANATOMY OF A CAPSTONE

The team of four students who worked on Gump — his name inspired, of course, by the film Forrest Gump — are enormously enthusiastic about their project. Team leader, Venkata Lakshmi Mantha, explains the greater learning objectives behind their creation. "We apply the knowledge from four years here," she says, "and we have to create a product and be able to sell the idea to the public."

The thinking behind Gump is that he is the prototype for the personal assistant-type robot of the future: a more sophisticated version of Gump could help with chores like taking out the trash and washing the floors. For now, the eight commands he responds to are simple, but the thinking behind the project is very sophisticated. Speech recognition is no easy task. Allowing for the sheer diversity of tones and accents, the team behind Gump collected over 5,000 voice samples. Furthermore, they had to study how humans walk, and needed to figure out how a much more limited robot could perform similar motions.

Yaz Khoury, the team member in charge of hardware, schematic design, and bipedal leg building, speaks for the whole group when he says, "We are passionate about personal robots—robots that humans can relate to."

That passion paid off when the team won the Electrical and Computer Engineering Capstone Design Project Award.

"THE REAL LEARNING PROCESS COMES WHEN YOU GIVE STUDENTS THE FREEDOM TO DESIGN ON THEIR OWN WITHIN CONSTRAINTS OF BUDGET AND TIME, AND WITH EXPERT OVERSIGHT. THIS GIVES US THE CHANCE TO TAKE THE THEORETICAL KNOWLEDGE AND APPLY IT."
—YAZ KHOURY

FROM CLASSROOM TO CAREER

Alumnus Brian Cromarty, BEng 97, MASc 01, can testify to the importance of experiential learning to launching a successful career. He now works from Princeton, New Jersey as a patent lawyer for the electronics giant, RCA, but in fact, he's been working in a related field ever since he was a Concordia student. His fourth-year project was an electrocardiogram — the challenge was finding a way to program a chip to perform cross correlation so that it could detect the frequency of a heartbeat. Working in this way with frequency spectrum of a signal such as a heartbeat is the cornerstone of diverse applications — from cellular technology to intercepting military aircraft.

Amy T.N. Ma is a member of a Capstone team that worked on a project for the McGill University Health Centre (MUHC). Their mandate was to create a master schedule for the Ambulatory Cancer Centre for the new "super-hospital" that is slated to open at the Glen Campus in 2015. Other team members include Johnny A. Paredes, Rodger S. Rasaga, Elizabeth Mokrusa and Pardeep Trehan—the latter two students were subsequently hired on by the MUHC to continue working on the project. Supervisor: Masoumeh Kazemi Zanjani

"I've talked to many other former students and we all agree, we all found these projects invaluable," says Cromarty. "They really tied together the theory of engineering."

During his undergraduate degree, Cromarty worked for two years with MPB Technologies in Pointe-Claire on the Island of Montreal. Robert Paknys, a professor in the Department of Electrical and Computer Engineering, had also worked with the company. Cromarty subsequently became Paknys master's student. His new project was very different from the electrocardiogram. He was now working in the area of electromagnetics and antenna design. The problem he was trying to solve would be familiar to anyone who has ever tried carving a turkey with an electric knife whilst concurrently watching television. The signal from the knife interferes with the television signal, creating the proverbial static "snow." It's a classic problem in radiated emissions.

To help solve problems like this, Cromarty worked with an experimental set-up consisting of a metal black box with a slot in it to house an antenna. "My job," he explains, "was to make sure the box didn't emit radiation but would also allow heat to escape." Calculating the ideal size of the aperture for the antenna was integral to Cromarty's finished research thesis.

Moving on from Concordia, Cromarty has established a successful career in the United States—an additional degree in law led him to his current position—but he still gets the chance to revisit his roots, while he is at RCA's offices on Boulevard de Maisonneuve, just a few blocks from his alma mater, two or three times per year.

A BLUEPRINT FOR BUILDING PROFESSIONALISM

Projects such as Cromarty's and, of course, Gump, epitomize the kind of problem solving and teamwork, that engineers and computer scientists must excel at in the workplace. For the Faculty of Engineering and Computer Science, having witnessed the successful evolution of the Capstone model doesn't mean the journey has reached a perfect end point — far from it. Change, in fact, has been the only constant all these years — and no one expects the pace of change to slow down, least of all William Lynch.

He describes many of the big steps his department, and of course the Faculty, is taking. "Mini" Capstones — introductory small-scale projects such as Sumo Bots — are now part of the student experience in the third year. Engineers-in-residence, who bring expertise and experience from industry on a full-time basis, have also been crucial. They oversee the students' work as it progresses, teach safety awareness, and help with the building of prototypes in the lab. Also, projects now have "a more clearly defined progression of phases," he says. This starts with formulating the specifications of what will be required for the project, who will be on team, and who will do what. Students are also now expected to go out and talk to potential customers and identify a possible need that they can help meet with a new product. Lynch is a firm believer that this phase is critical. "If you really want to be successful, you have to talk to your customers," he says.

Students also have a chance to learn from their peers and from successive generations of similar projects. For example, the Ice Runner (pictured on page 3) is the second iteration of a Capstone project.

Yaz Khoury from the Gump team sums up the Capstone spirit perfectly: "The real learning process comes when you give students the freedom to design on their own within constraints of budget and time, and with expert oversight. This gives us the chance to take the theoretical knowledge and apply it."

The Gump of the future would doubtless nod his head in full agreement.

GENEROUS GIFT FOR GLOBAL ENGINEERING

NEW INITIATIVE GIVES STUDENTS OPPORTUNITIES TO LEARN GLOBALLY, PRACTICE LOCALLY

Thanks to a generous gift of $125,000 from Concordia alumni Susan Raymer, BA 71, and Ben Wygodny, BA 69, the Faculty of Engineering and Computer Science is now able to build on its unique advantage in the way it teaches social responsibility, ethics and professional communication. Unlike other Canadian engineering schools, students learn these important complementary skills from disciplinary experts dedicated to teaching engineering and computer science students. As director of the Centre for Engineering in Society, Deborah Dysart-Gale, points out, "We tailor our course offerings to ensure they reflect an engineering perspective on issues. That's our advantage."

The gift has enabled the creation of the Global Engineering Initiative, which will give even more opportunities to engineering students to learn about the demands on their profession in a global context.

"What we're better able to do now, thanks to this visionary gift from Susan and Ben, is to position Concordia as a catalyst for change," says Dysart-Gale. "We're providing all the essential elements to a new cohort of student leaders, ensuring they have not only the technical skills, but also the 'big picture' understanding needed to tackle the world's seemingly intractable problems."

Funding will provide the opportunity for engineering students to collaborate directly with community clients in Northern Quebec, increasing their ability to communicate effectively with people across distance and cultural barriers. The gift will also allow the creation of a web-based, virtual global engineering hub, designed with collaborators from the United Kingdom and Australia.

"Students bring back so much new knowledge when they see how engineering issues play out elsewhere," says Dysart-Gale.

Malex Alebikiya, a close family friend of Keena Trowell's, in Tamale, Northern Region, Ghana. Trowell took the photo while traveling in Ghana in 2013. Alebikiya is holding a bag of drinking water, called Pure Water by local residents, which is the most common drinking water available in many parts of the country, but varies enormously in its level of purity. Scarce water resources are one of many challenges students encounter when learning about engineering in the global context.

"They bring a new perspective to their professional practice back home and are also sensitized to how they can play a stronger role in tackling global problems."

The initiative will also support "lunch and learn" events with high-profile keynote speakers; a new website that will serves as a clearing house for relevant articles and other resources on global engineering; as well as development of best practices in socio-tech assessments — methods for incorporating global engineering concerns into new projects. Concordia's District 3 Centre for Innovation and Entrepreneurship will be a key partner in this, as students develop new products and services with social impacts in mind.

The new initiative has strong support already among students. Fourth-year mechanical engineering student Keena Trowell, who is also the co-president of the Concordia chapter of Engineers Without Borders, says, "Whether as an engineer, a designer or simply an active citizen, we must never forget that we're in the service of others. That's the thinking behind global engineering."

SPOTLIGHT ON

RESEARCH

WITH FILES FROM MALCOLM MCLEAN, SUZANNE BOWNESS AND CLÉA DESJARDINS

POLYTECHNIQUE AND CONCORDIA SIMULATE AN EARTHQUAKE

In Polytechnique Montréal's structural engineering laboratory, a team led by Lucia Tirca, an assistant professor in Concordia's Department of Building, Civil and Environmental Engineering, and Robert Tremblay, a professor in Polytechnique's Department of Civil, Geological and Mining Engineering, tested and analyzed the response of a steel brace protected by a Pall Friction Damper to the force equivalent of the one g of acceleration.

This was the first full-scale, real-time test of the Pall Friction Damper seismic control system, which is designed to mitigate the natural disaster's impact on buildings.

The idea was to reproduce the behaviour of a real building during an earthquake — specifically the lateral displacement of the structure's elements that occurs when an earthquake hits. "The conventional building code philosophy is to design structures to resist moderate earthquakes without significant damage and to avoid collapse during a major earthquake," said Avtar Pall, PhD 79, the inventor of the Pall system, who earned his PhD from Concordia.

"With this testing regime, we will be able to provide detailed information and facilitate the use of this system in steel buildings," Tirca said.

IMPROVED PAVEMENT MARKINGS CAN SAVE LIVES

As Montreal emerges from another ferocious winter, the battered roads are re-exposed. While potholes and cracks might make news, a larger concern should be the deterioration to pavement markings, those yellow or white lines, which are a major factor in preventing traffic accidents.

A study from Concordia University, funded by Infrastructure Canada and published in Structure and Infrastructure Engineering, found that snowplows are the biggest culprit in erasing roadway markings.

The research team also examined the impact of salt and sand on the visibility of pavement markings. The conclusion: a simple switch in paint can save cars — and lives.

Using data from the Ontario and Quebec ministries of transportation and the municipalities of Montreal and Ottawa, Tarek Zayed of the Department of Building, Civil and Environmental Engineering measured the relationship between materials used in pavement markings, and their age and durability.

He also compared highways with city roads, examined traffic levels and took note of the types of vehicles involved. Finally, Zayed and his research team examined marking types such as highway centre lines, pedestrian crosswalks and traffic intersections.

They found snowploughs to be the worst on roads because they literally scrape paint off the streets. "Snow removal is the major contributing factor to wear and tear on pavement markings, because when snow is pushed off the road, part of the markings is taken off too," says Zayed.

SAE FINISHES FIRST IN DETROIT

The Society of Automotive Engineers (SAE) World Congress and Exhibition in Detroit, Michigan is one of the biggest car industry events of the year. It was on this international stage that, on April 8, Concordia's student chapter of the SAE and its Supermileage project clinched first place in the prestigious Student Exhibit Competition.

"We've been evolving and improving consistently," says Patrick Leclerc, a third-year engineering student. "This success helps our SAE chapter enormously."

Concordia's team finished ahead of 10 others, including groups from Puerto Rico, the United States and, closer to home, Polytechnique Montréal. The competition's judges included industry experts from companies like General Motors, Ford, Chrysler and NASCAR.

The team had 10 minutes — including a question-and-answer session — to make a winning impression.

As Norvan Gharabegi, a fourth-year mechanical engineering student, explains, this was no easy feat. "SAE has created many technical standards used in the industry today, and we had to show how we've incorporated these into our project."

WARREN ZELMAN

The project under scrutiny was the students' Supermileage car, a vehicle designed to travel long distances using as little fuel as possible.

Concordia students have built and raced several Supermileage cars since 1986, when the team was founded, and this year's model may be the best yet. Its shell and chassis weigh in at only 28 pounds, and it's made from the same grade of carbon fiber materials that you would find in a Learjet.

Of course, a victory this big doesn't come without a lot of help. While only five SAE team members travelled to Detroit, numerous others worked very long hours on the project. Even a graduate — Raymond Lafrance, BEng 83, general manager at Montreal's Contact Rubber — played a major part in the win.

"He's been going out of his way to help us this year," Leclerc says. "He's like an honourary team member.

The victory for SAE represents not just what Leclerc calls a "vote of confidence" in the team's car; it's also an academic achievement, since the team members that focused on the manufacturing process used this experience for their Capstone — the final-year project that all undergraduates studying in Concordia's Faculty of Engineering and Computer Science must complete in order to graduate. The vehicle was also recognized with a Department of Mechanical and Industrial Engineering Design Award.

After the success at home and in Detroit, the team went on to win the 35th Anniversary Endurance Award, which requires a minimum of five successful fuel economy runs, at the SAE Supermileage® competition held June 5-6, 2014, at Eaton's Proving Grounds in Marshall, Michigan.

The Supermileage team's members also include Tareq El-Alami, Derek Greenblatt, Khizer Uddin and Mohamed Ammar Nsiri.

The team's sponsors are Bombardier Aerospace, Le Milsa, GlobVision Inc., Contact Rubber Inc., Cimetrix Solutions Inc., Composites Atlantic, Intelligent Light, Freeman Supply, Xpoze, Eaton Corporation, Briggs & Stratton, Henkel-Loctite, Wesco Aircraft, bigHead, Sticky Grafix, ANSYS, Fonds Férique, ELSÖ Ltée and Concordia's Engineering and Computer Science Association.

ALUMNI PROFILE:

BIO-INSPIRED

GAVIN KENNEALLY

BY CARL GOULDSON

In his third year as a mechanical engineering bachelor's student, Gavin Kenneally, BEng 12, gave a TEDx talk that addressed the impact 3D printing would have in the world of technology. He outlined some of the unique work he was doing at Concordia and explained the steps he intended to take to help push the field forward in the years to come.

Kenneally had been inspired early on in his academic career by another TED talk — this one focusing on bioinspiration and biomechanics. Professor of Biology at the University of California-Berkeley, Robert Full, addressed the concepts of bioinspiration and biosymbiosis in his own work and described the practical combination of biology and engineering.

Kenneally has since pursued many of the objectives he laid out three years ago, and is now a doctoral candidate at the University of Pennsylvania's School of Mechanical Engineering and Applied Mechanics.

"I'm still really interested in bioinspiration," he says, "so what I'm currently looking at are the advantages and disadvantages in the various ways that you can measure the performance of leg designs in robots." Kenneally will be presenting his preliminary work this June at the International Conference on Robotics and Automation (ICRA) in Hong Kong.

He says of his years at Concordia, "There were many options for interesting internships and a lot of freedom to do what you wanted."

Kenneally's first material science class was with Paula Wood-Adams, professor in the Department of Mechanical and Industrial Engineering, which led to an invitation to pursue research in material science in her lab the following summer, where he first worked with poly-lactide—a substance derived from renewable resources (corn starch for example) and very safe for use in 3D printing. Kenneally also feels very grateful to have worked in the laboratory of Luis Rodrigues, associate professor in the Department of Electrical and Computer Engineering.

Concurrent with his academic work, Kenneally represented his year in Concordia's Garnet Key leadership symposium, which he describes as both inspiring and integral to the connections he's made throughout his academic career.

"It was great that the professors were so open and so willing to let me come and work in their labs, where I was able to do so much research at the end of my first year," he says. "Concordia did a really good job of preparing me for all of the hands-on aspects of engineering… A lot of the labs we did were much more hands-on . . . All of the applied aspects of engineering — I've been really well prepared for that."

"CONCORDIA DID A REALLY GOOD JOB OF PREPARING ME FOR ALL OF THE HANDS-ON ASPECTS OF ENGINEERING."

WHAT EXACTLY IS BIO-INSPIRATION?

One of the best definitions is provided by the researchers at the San Diego Zoo Global Center for Bioinspiration: "a methodology in which biological systems, processes, and elements are studied to draw analogies to be applied to human design and industrial challenges."

HOMECOMING 2014

September 19 to 22

Université Concordia University

Save the dates!

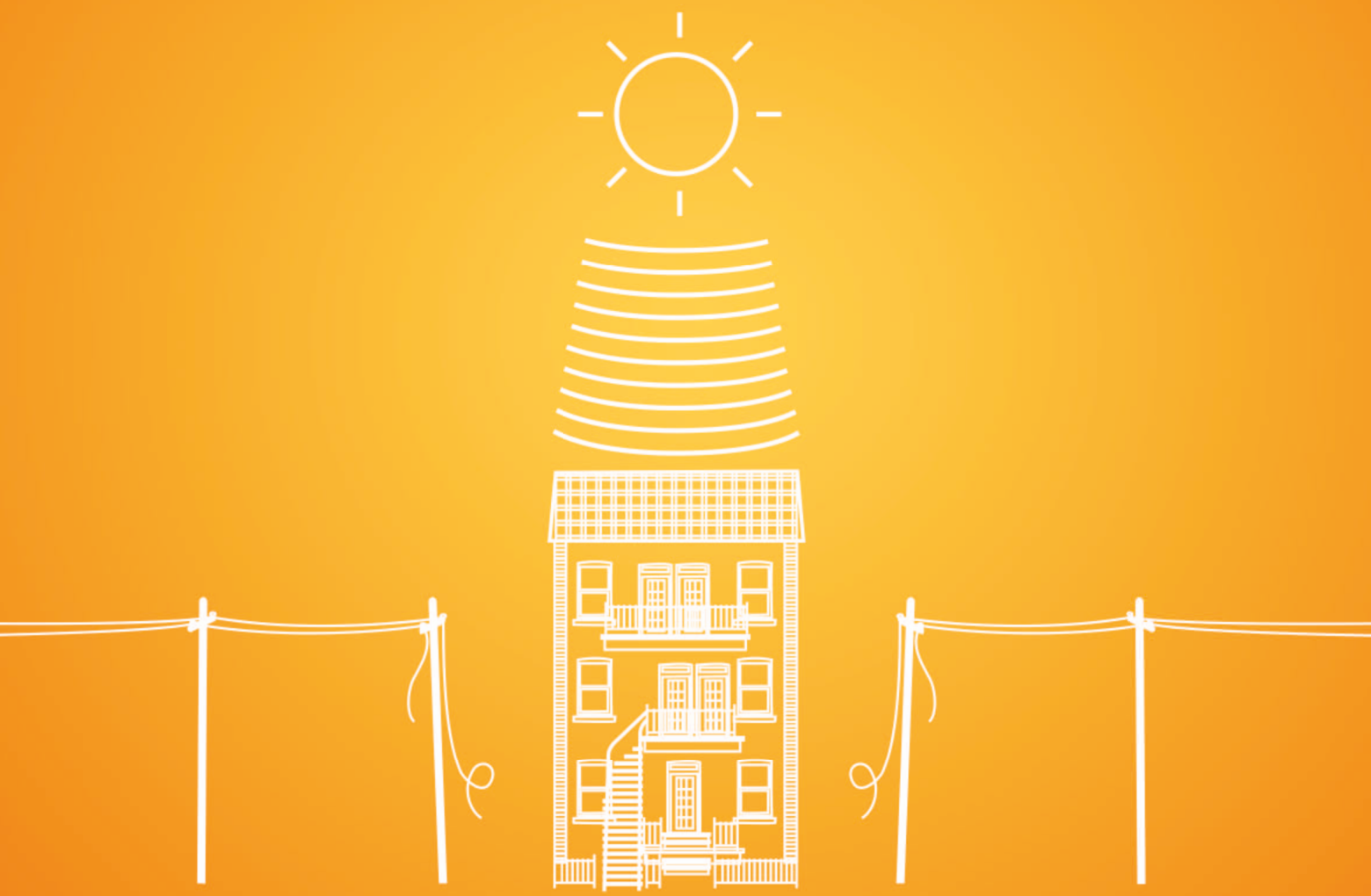
Join classmates and past professors at the 2014 **Engineering and Computer Science** Homecoming Reunion Cocktail followed by a university-wide President's Dinner. We will celebrate graduating years ending in 4 or 9 — from the class of (pre) 1959 to 2009! All alumni are welcome. Be there for these and other tremendous events.

For more information, contact Sarah Kenny at 514-848-2424, ext. 7026, or sarah.kenny@concordia.ca

concordia.ca/homecoming

#CUHomecoming

SMALL PLANET BIG THINKING



BE PART OF THE THINKING

By giving to the Faculty of Engineering and Computer Science you empower Concordia students and researchers to advance off-the-grid technology.

And more.

Your gift promotes sustainability and big thinking. Designate your gift towards your faculty or support other areas of interest to you. Contact Sarah Kenny, from Concordia's Advancement and Alumni Relations, at 514-848-2424, ext. 7026, or **Sarah.Kenny@concordia.ca**

concordia.ca/giving

Université Concordia University