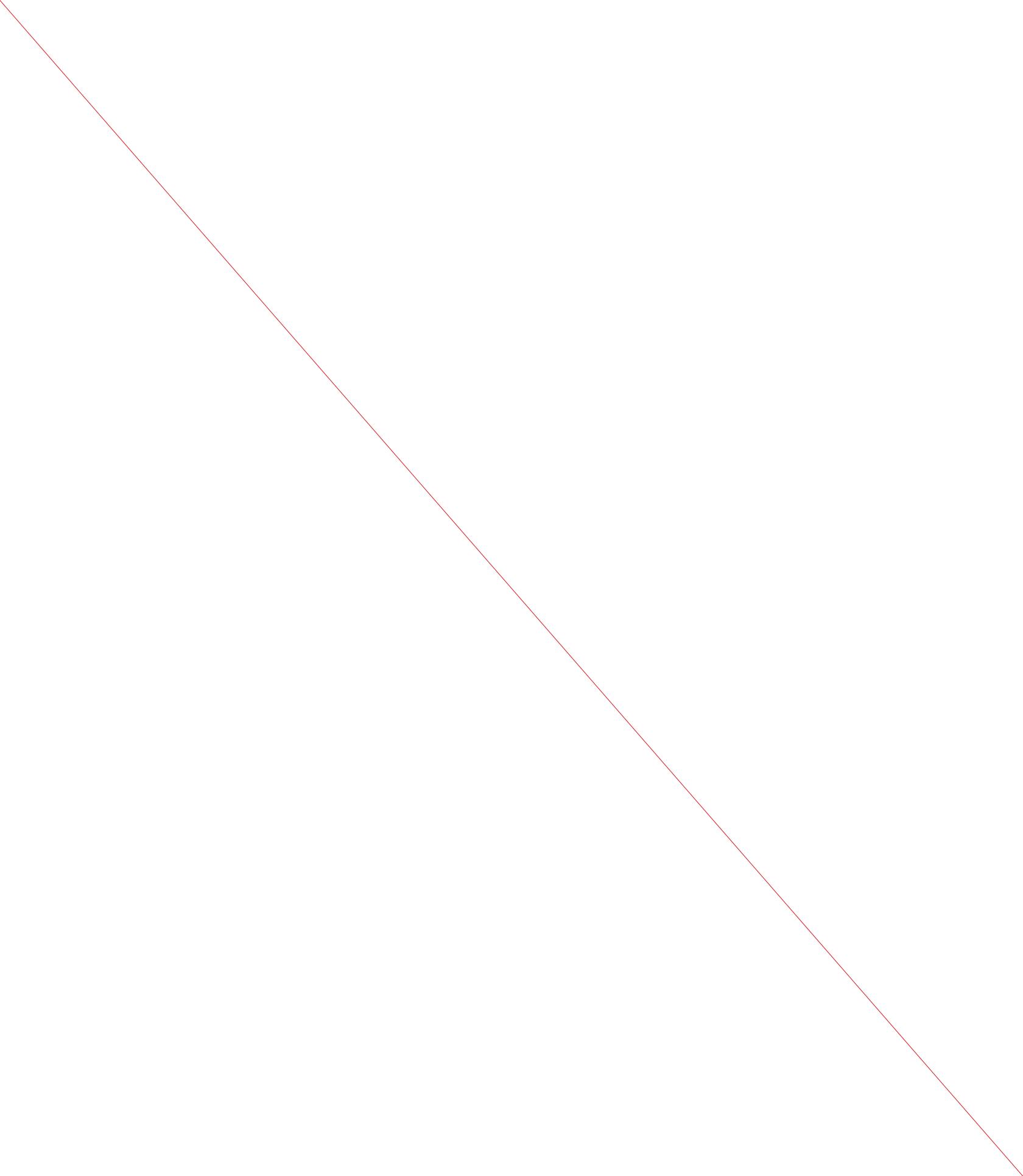


**REDEFINING THE POSSIBLE:
THE IMPACT OF YOUR SUPPORT**

Faculty of
Engineering
Major Gift
Report 2016

–
McGill
University



"NEVER DOUBT THAT
A SMALL GROUP OF THOUGHTFUL,
COMMITTED CITIZENS CAN CHANGE
THE WORLD. INDEED, IT IS
THE ONLY THING THAT EVER HAS."

— MARGARET MEAD



→ The McGill Faculty of Engineering community celebrates at the Annual Reception in Honour of Our Philanthropists in April 2016.



THANK YOU!

Generous support to
the Faculty of Engineering
from alumni such as you
enables ground-breaking
research and helps educate
tomorrow's leaders.
By giving to your Alma Mater,
we all stand to benefit.

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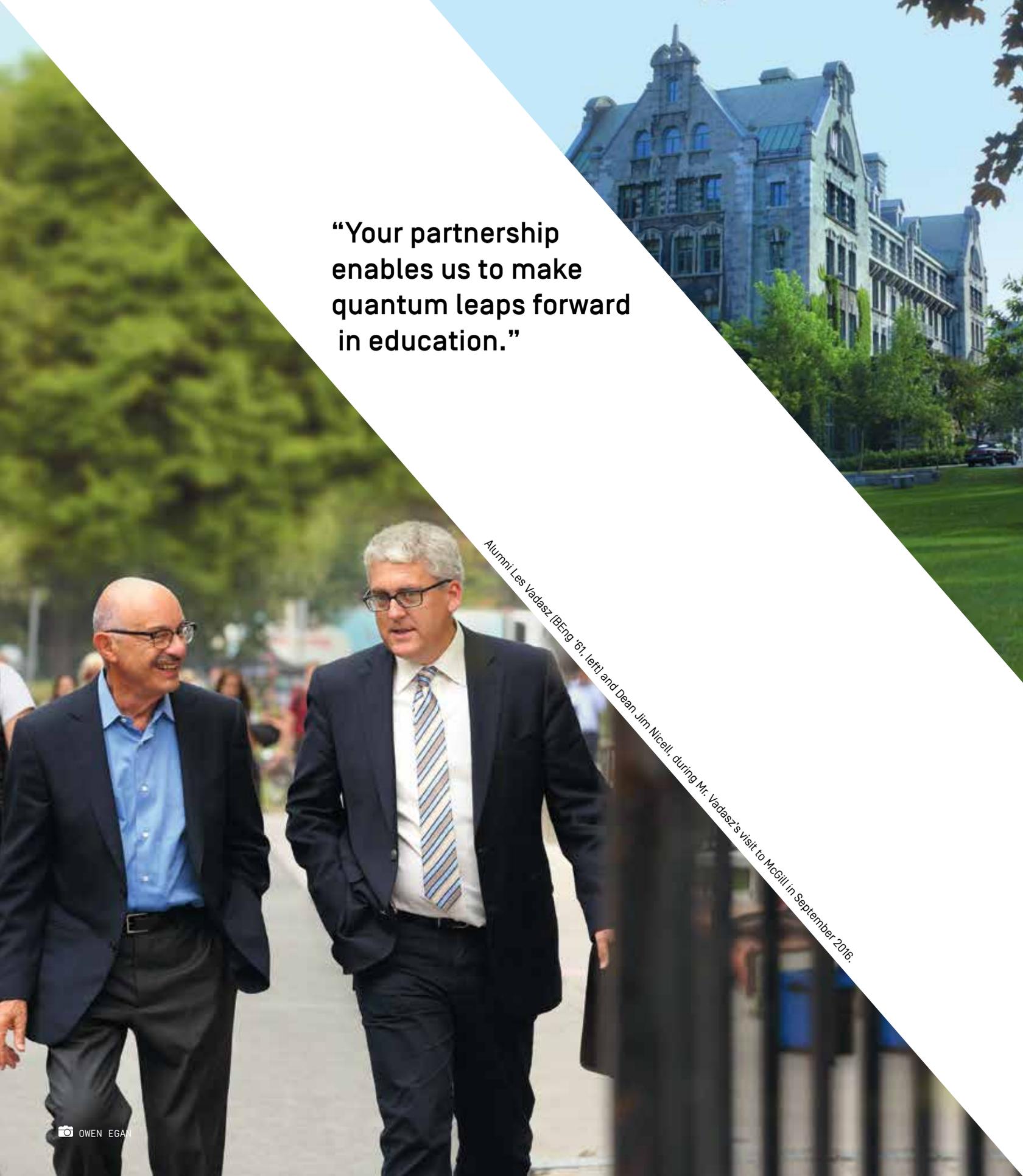
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**“Your partnership
enables us to make
quantum leaps forward
in education.”**

Alumni Les Vadez (BEng '67, left) and Dean Jim Nicell, during Mr. Vadez's visit to McGill in September 2016.

A MESSAGE FROM DEAN JIM NICELL **REDEFINING THE POSSIBLE**

On behalf of the Faculty of Engineering, its students, professors, researchers, and staff, thank you for the generous support you continue to give us. Your partnership with us is opening up completely new fields for the Faculty and enables us to make quantum leaps forward in education. By guiding us toward these new frontiers of knowledge, you help our students learn today and to respond to the challenges they will face in the future. But your help goes beyond education; you are also helping us build a community that enriches the learning experience and provides a network of support that can help our graduates build their professional careers.

There are many reasons why your partnership is more crucial than ever: the professions of engineering, architecture and urban planning are evolving in ways no one could ever have predicted, even just a few years ago. The ubiquity of technology, new materials, interdisciplinary study, increasing globalization, climate change—the potential challenges are many and growing. In order to remain ahead of this accelerating transformation, we as a Faculty must continually explore the new and exciting paths that our graduates can follow during their careers. You, our alumni, are making that journey possible.

In this report, we look at three areas where partnerships with alumni have been extremely influential: bioengineering, teaching enhancement and graduate student support. They demonstrate how you are enabling new ways of thinking, researching and educating that are preparing students for their future careers.

We are proud to announce that this year the Quebec *Ministère de l'Éducation et de l'Enseignement* authorized us to launch the Department of Bioengineering's new undergraduate program. This is a monumental event—Bioengineering is the first new department to be created in the Faculty in 70 years—and it would not have been possible without pivotal partnerships with alumni like Marika Roy [BEng'61], along with those who are supporting the journey, such as Barry Cooke [BEng'75].

What began in 2013 as the Teaching Enhancement Initiative (TEI) has had a profound effect on the passion for imparting knowledge in the Faculty. It has spawned dozens of active learning initiatives that are having a direct impact on the educational experience of the majority of our students. Were it not for a visionary alumnus who wanted to assist professors to improve the quality of teaching, the development of this exciting program to enhance the culture of learning throughout the Faculty would not have been possible. Since then, other alumni friends such as Arthur Allan McAlear (BEng'57) and former Dean Gerald Farnell (PhD'57) and his wife Norma have provided grants for professors to experiment with new teaching approaches that are defining new boundaries in participatory learning.

Finally, the McGill Engineering Doctoral Awards (MEDA) program, launched under the leadership of former Dean Christophe Pierre and founded through a seminal gift from alumnus Les Vadasz (BEng'61), is now an \$8 million award system at the heart of our graduate research program. Its success enables us to attract top graduate researchers, which in turn has impacted the research quality of our professors. Time and time again, our students testify to the tremendous role that fellowships have played in their studies and in their subsequent careers. In supporting these exceptional students and professors in their pursuit of their passion for research, you are making McGill's Faculty of Engineering the leading choice in Canada for ground-breaking research & innovation.

As Dean, I sincerely thank you for rallying together to keep McGill at the forefront of education and to help us make these and many other substantial achievements. Your continued partnership and support help us redefine what is possible.



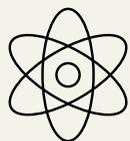
Jim A. Nicell
Dean / Faculty of Engineering

BIOENGINEERING RESEARCH



BIOENGINEERING IS THE TWO-WAY HIGHWAY BETWEEN LIFE-SCIENCES AND ENGINEERING.

Synthetic bone material that can be shaped by a 3D printer, robotic exoskeletons that allow paralyzed patients to walk, blood screening for cancers that is 100% accurate—the future of healthcare is being transformed by the convergence of medicine, biology, and engineering. But bioengineers are not limited to medical objectives alone; they are also exploring the frontiers of a range of environmental, computational, and materials applications—living matter is what they are working on every day. Thanks to the vision of philanthropists in the McGill Faculty of Engineering who bet on the future of these new developments, the Department of Bioengineering is producing world-class research on this high-speed knowledge highway.



90 research papers
have been published.



The Department of
Bioengineering has grown
to a faculty of 7 professors.



59 graduate and undergraduate students
are currently studying in the new Department
of Bioengineering, established in 2016.

BUILDING LIVING, BREATHING SUPERCOMPUTERS

Chair Dan Nicolau's work on protein-fuelled biocomputers is an example of the world-class research in the Faculty's new Department of Bioengineering.

The substance that provides energy to all the cells in our bodies, adenosine triphosphate (ATP), may also be able to power the next generation of supercomputers. That is what an international team of researchers led by Prof. Nicolau, the Chair of the Department of Bioengineering at McGill, believe.

Nicolau and his team published an article on the subject earlier this year in the Proceedings of the National Academy of Sciences (PNAS), in which they describe a model of a biological computer that they created that is able to process information extremely rapidly and accurately using parallel networks in the same way that massive electronic supercomputers do.

But their model bio-supercomputer is much smaller than current supercomputers, uses much less energy, and uses the same proteins present in all living cells to function.

DOODLING ON THE BACK OF AN ENVELOPE

"We've managed to create a very complex network in a very small area," says Dan Nicolau with a laugh. He began working on the idea with his son, Dan Jr., more than a decade ago and was then joined by colleagues from Germany, Sweden and The Netherlands, some seven years ago.

"This started as a back-of-an-envelope idea," he explained, "with drawings of what looked like small worms exploring mazes."

The model bio-supercomputer that the Nicolaus (father and son) and their colleagues created came about thanks

to a combination of geometrical modelling and engineering know-how at the nanoscale. It is a first step in showing that this kind of biological supercomputer can actually work.

The circuit the researchers have created looks like a road map of a busy and organized city. Just as in a city, cars and trucks of different sizes, powered by motors of different kinds, navigate through channels that have been created for them, consuming the fuel they need to keep moving.

MORE SUSTAINABLE COMPUTING

But in the case of the biocomputer, the city is a chip measuring about 1.5 cm square onto which channels have been etched. Instead of the electrons that are propelled by an electrical charge and move around within a typical microchip, short strings of proteins (which the researchers call biological agents) travel around the circuit in a controlled way, their movements powered by ATP, the fuel for the functioning of each and every living cell.

Because it is run by biological agents, the model bio-supercomputer that the researchers have developed uses far less energy than standard electronic supercomputers do and emits far less heat, making it more sustainable. Conventional supercomputers, on the other hand, consume significant amounts of electricity to cool down their processors, often requiring dedicated power generators to remain operational.

Thanks to the support of friend of the Faculty Marika Roy, Dan Nicolau can continue his research at McGill.

FROM MODEL TO REALITY

Although the model bio-supercomputer was able to efficiently tackle a complex classical mathematical problem by using parallel computing of the kind used by supercomputers, the researchers recognize that there is still a lot of work ahead to move from the model they have created to a full-scale functional computer.

Thanks to the support of friend of the Faculty Marika Roy, Dan Nicolau can continue his research at McGill.

“Now that this model exists as a way of successfully dealing with a single problem, there are going to be many others who will follow up and try to push it further, using different biological agents, for example,” says Nicolau.

“It’s hard to say how soon it will be before we see a full-scale bio-supercomputer. One option for dealing with larger and more complex problems may be to combine our device with a conventional computer to form a hybrid device. Right now we’re working on a variety of ways to push the research further.”

Professor Dan Nicolau, Chair of the Department of Bioengineering

An artist's conception of the protein highways in a bio-supercomputer.



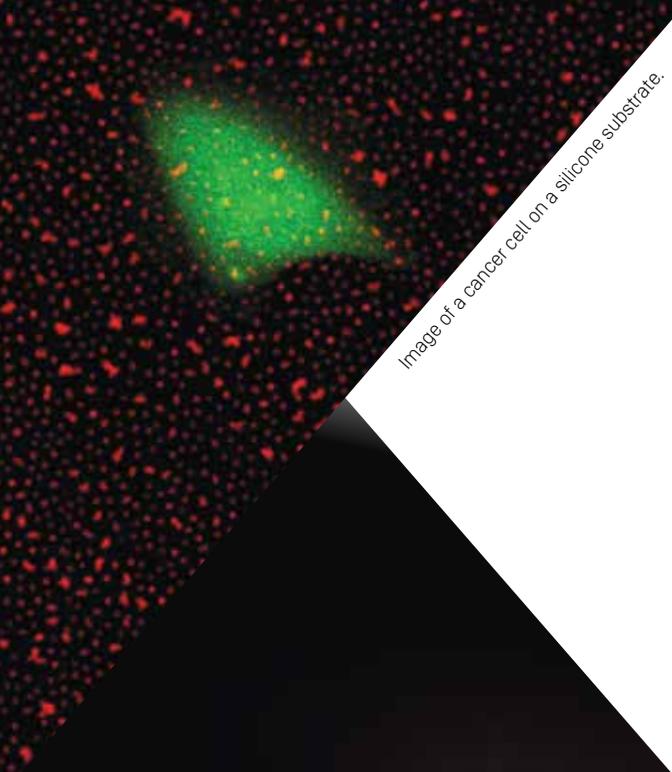
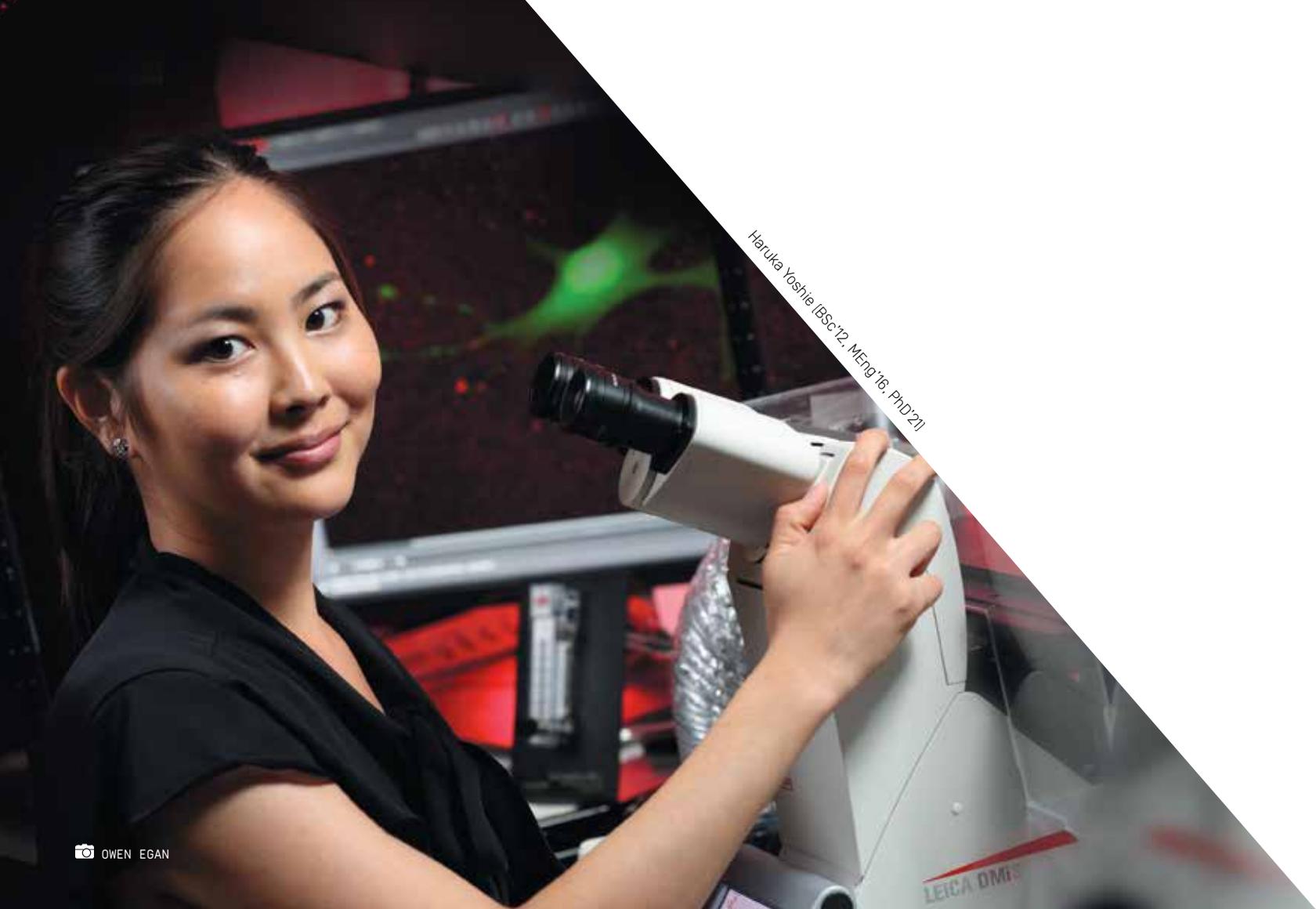


Image of a cancer cell on a silicone substrate.

“What’s wonderful about the Bioactive Materials Lab is the interdisciplinarity of the team.”



Haruka Yoshie (BSc'12, MEng'16, PhD'21)

THE PHYSICS OF DISEASE

PhD candidate Haruka Yoshie hopes that by furthering the knowledge of how cells move we might be able to slow the speed at which cancer spreads.

Behind the closed doors of Microscopy Room 5B-5518, McGill Engineering student Haruka Yoshie (PhD '21) switches off the overhead lights and sets herself up in front of the confocal microscope. The sample on the microscope stage appears on the computer screen to her left—a sizable fluorescent green cancer cell in the centre of a galaxy of small red dots.

She adjusts the knobs of the microscope to pull the image into focus. Yoshie records how far the cell has 'crawled' along the substrate since the last time she looked at it. She can tell this by measuring its change of position relative to the red fluorescent nano beads that she's embedded in the substrate. She is also looking at how much the beads have been displaced by the pull of the cell's crawling machinery. With all this information, she will be calculating the forces the cell is applying to its artificial silicone substrate.

Such are the physics of 'cell crawling,' the movement of our cells through the body.

CELLULAR MOBILITY

"Cells are so interesting," the doctoral student begins. Her research is funded by the Quebec government and through the **Vadasz Fellowships in Engineering**. "Our cells move to develop organs as embryos, to fight a disease through the immune system, and to close the wound when our skin is cut. But as much as this process is essential to good health, it can also play a part in ruining it—the same cell crawling is used by cancer cells in metastasis."

During metastasis, cancer cells travel from their primary site to secondary sites, spreading the disease in our body. This behaviour accounts for 90% of cancer-related deaths, so understanding how this works is of great interest to cancer research.

Yoshie is studying one of the physical mechanisms by which cancer spreads, called Epithelial to Mesenchymal Transition

[EMT]. When this occurs, the cells of cancer tumours switch from a less active to a very active state.

"The physical changes that occur during EMT are still not well understood," explains Yoshie. "My doctoral research hypothesizes that the cancer cells are applying larger forces and that this is what enables them to change position in the body and spread the disease. If this is so, we may one day be able to use it as a predictive tool in cancer diagnosis."

THE WAY TO MCGILL

Yoshie arrived in Canada from Japan as a high school exchange student, first settling in the small town of Port Alberni, nestled at the end of a deep sea inlet that reaches into the centre of Vancouver Island. Hungry for different cultures and languages, she quickly adopted her new community and the English language, ultimately remaining in Canada after graduating from Port Alberni District Secondary School.

"I had to convince my parents to let me stay another year—they weren't too happy at first," she remembers. Yoshie's love affair with Canada would see her move east to Québec, to study chemistry at McGill. After becoming a permanent resident of Canada, she then enrolled in a Master's program under Professor Allen Ehrlicher in the new Department of Bioengineering.

"I immediately felt comfortable with Allen. What's wonderful about the Bioactive Materials Lab is the interdisciplinarity of the team. We have some in mechanical engineering, some in biology, some in chemistry—different disciplines make us stronger and more fun."

MORE FUN, BETTER TECHNIQUES, BETTER RESULTS

For her Master's, Yoshie and her colleagues helped develop a novel silicone substrate technique for use in traction force microscopy.

"Traditional hydrogel substrates on which we place cells are hard to control, as they can be affected by humidity and pH changes, salt concentration and temperature. Silicone is inert and has a much longer shelf life." Yoshie's new technology also included the use of up to 96 wells with unique cell samples all in one dish, vastly increasing the research 'throughput.'

"With this higher output method, we can better test different drugs and their ability to affect the progress of metastasis in our cell movement tests," she says. "If we find changes in the physics of cells in certain diseases, maybe by tuning that, we can find ways to slow down the progress of the disease."

MARIKA'S JOURNEY

When Marika Zelenka Roy made her seminal gift in 2008, it set off changes that helped establish the Department of Bioengineering in the Faculty of Engineering, thus beginning a new philanthropic journey for her—one more adventure to chalk up in an already eventful life.

It is nearly midnight on December 31, 1956, high in the Hungarian Alps. A slight and nervous 18-year-old girl presses against her mother in the back of a horse-drawn sleigh, racing down a snow-blown road that winds around a steep mountainside. She peers out from under the white blanket someone gave her for camouflage. The Hungarian authorities are looking for them: their yellow flares swoop overhead, lighting up the grey faces of the mountaintops. As the sleigh ploughs on, the wind biting her cheeks, she sees the dark figures of several men up ahead in the road. Her heart freezes: she is certain they've been caught. But as the sleigh draws nearer, and the wind drops, the sound of their voices reveals that they are Austrian.

She has made it across the border. She has escaped from Communist Hungary.

This could be a scene from a film, but it happens to be the true story of Marika Zelenka Roy (BEng'61), the alumna who helped launch the Department of Bioengineering by establishing its first endowed Chair. Her journey from a young girl in Hungary to her days as one of the first female students to study electrical engineering at McGill is a testament to the fortitude and dedication of those first-generation Canadians who passed through the Faculty of Engineering.

THE HUNGARIAN EDISON

Roy (née Zelenka) was born in Budapest, Hungary. Her father, Laszlo Zelenka, was known as the 'Hungarian Edison' because he was always inventing electrical devices (including a way-before-its-time optical pen text-reader for the blind).

He made his name manufacturing electrical signal generators for China. It was in her father's business that Roy would start a lifelong fascination with electronics, but she was not to pursue that dream in Hungary.

"I clearly remember the day—December 28th, 1949," says Roy. "I was in my father's shop when this rather respectable-looking fireman came through the door and said: 'From today on, by order of the state, I am the boss here. I am going to run this place.' The State had decided private enterprises were exploiting the people, and so they took away his factory. Nationalization was like that—from one day to the next, you lost everything."

So Laszlo Zelenka smuggled the young Marika and his wife out of Hungary via train and sleigh, part of a wave of over 200,000 Hungarians who fled during that period of the country's history. She was never to see her father again: Zelenka died of an illness several years later in Hungary, while his wife and daughter embarked on a new life in Canada.

MCGILL AND MARRIAGE

The early days in Montreal were a challenge for her and her mother. Roy struggled to brush up on the English she had learned in Budapest, just in time to make her application to McGill's Faculty of Engineering (in Electrical, of course).

It was no easy thing for a woman back in 1957.

"I couldn't really afford to go to McGill, but the Board of Directors was giving out 25 Hungarian student scholarships that year," she remembers. "The only reason I eventually got a bursary is because a certain Mrs. Smith on the Board supported my case. The Board was against a scholarship application from a woman for Engineering. They said, 'We should give it to a student who will actually finish the program'."

The valiant 'Mrs. Smith' fought Roy's case on the basis of her excellent academic merit, and managed to change her colleagues' minds.

**“McGill did so much
for me, where else
could I give with this
much heart?”**

Maika Zelenka Roy [BEng '81]



If Roy is thankful for her days at McGill Engineering, it is partly for the education it gave her, partly that it helped her to an eventual career at Canadian Marconi Company (CMC), but mostly because it was where she met her husband-to-be, Alain Roy (BEng '61).

A French-Canadian from Trois-Rivières, Roy was also a freshly-minted navy man from the Royal Military College in Kingston. He had come to McGill to study electrical engineering in the fifth and final year to get his university accreditation. Arriving in the same year that Zelenka was finishing her studies, the couple fell in love while at school and married soon after graduation.

ON THE MOVE

Roy would bring his wife Marika on some journeys of his own. Taking a job with IBM after leaving school, the couple relocated to Quebec City ("IBM stands for 'I've Been Moved'," she jokes). Roy, now a young mother, appreciated the peace and quiet of "La vieille capitale," away from the big-city bustle of Montreal.

Alain Roy was not at IBM very long before he and a couple of colleagues (one a friend from his RMC days) set up an IT company of their own. Founded in 1972, Ducros, Meilleur, Roy (DMR) would eventually become the largest information systems service provider in Canada, providing the scoring systems for both the Montreal and Moscow Olympics.

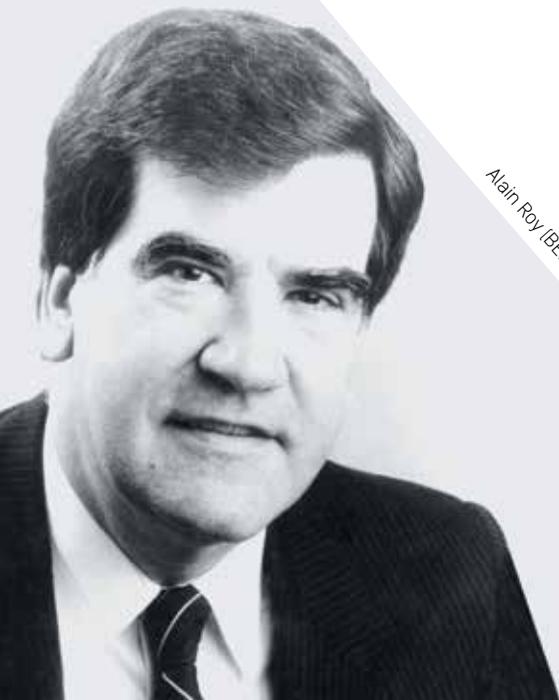
Marika Roy eventually left CMC to follow her husband on his business trips visiting DMR branch offices around the world—Singapore, Bangkok, Hong Kong, Melbourne and Sydney—wonderful memories she shared with her husband before his untimely death in 1994.

A JOURNEY OF GIVING

After the sale of her husband's business to Fujitsu, Roy deepened her commitment to her philanthropic activities. She became a supporter of many causes, but first on her list was McGill University.

Roy's generosity goes beyond contributing to the Department of Bioengineering. She has also given to the construction of the Lorne M. Trottier Building (a room there bears her name), and she supported the Montreal General and St. Mary's hospitals with new equipment.

"I was reading a publication about McGill alumni," she remembers, "and one of them spoke about how much he felt he owed McGill for what it brought him. And I thought, 'Why not me?' McGill did so much for me, where else could I give with this much heart?"



Alain Roy (BEng '61)

FAMILY FOUNDATION

Bioengineering Research

After 40 years in civil engineering, Barry Cooke made a bold statement for the future of education... in the field of bioengineering.

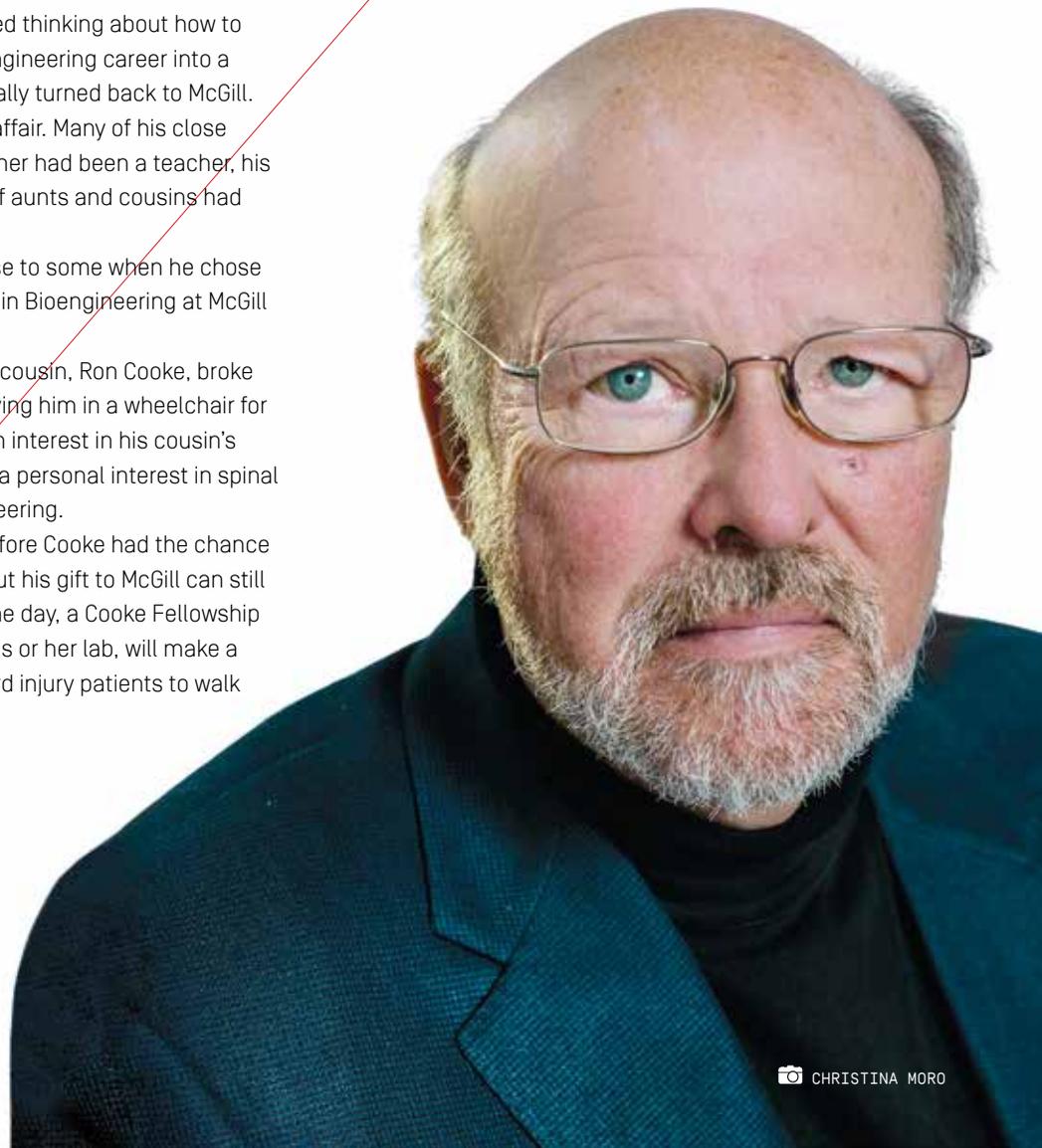
Barry Cooke (BEng '75)

When Barry Cooke (BEng '75) started thinking about how to turn the fruits of his successful engineering career into a lasting legacy, his thoughts naturally turned back to McGill. Education was, after all, a family affair. Many of his close relations were educators: his brother had been a teacher, his father a principal, and a handful of aunts and cousins had gone into the field as well.

But it might have been a surprise to some when he chose to establish the Cooke Fellowship in Bioengineering at McGill in 2015.

In 1963 Cooke's 17-year-old first cousin, Ron Cooke, broke his spine in a diving accident, leaving him in a wheelchair for life. Later, Cooke developed a keen interest in his cousin's condition, which led ultimately to a personal interest in spinal cord injury research and bioengineering.

Cooke's cousin passed away before Cooke had the chance to tell him about the fellowship. But his gift to McGill can still do good by his cousin: perhaps one day, a Cooke Fellowship student, working late at night in his or her lab, will make a discovery that will allow spinal cord injury patients to walk once more.



eLATE!



Professor Lawrence Chen (BSEng '85) leads a class.

THE FACULTY OF ENGINEERING'S 'ENHANCED LEARNING AND TEACHING IN ENGINEERING' [eLATE] INITIATIVE HAS SPARKED INSPIRING PEDAGOGICAL INNOVATIONS IN THE FACULTY.

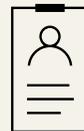
Beginning in January 2013 as the Teaching Enhancement Initiative, eLATE has since become a catalyst for a dramatic culture change in teaching practices in the Faculty. From flipped classrooms, where the students take an active role in their learning process, to the use of smartphones for immediate feedback on in-class assignments, eLATE constitutes a revolution in engineering education in which teaching is enhanced by evidence-based practices.



Over 2,600 students have been impacted by the program since 2013.



More than 50 professors have participated in TEI and eLATE activities.



25 Research Assistants (RAs) have been hired through TEI and eLATE programs.

eLATE : A TIMELINE OF SUCCESS

In just four years, something that began as a simple idea to improve the quality of teaching in the Faculty of Engineering has matured into a multi-activity program that is turning the Faculty into a resource for innovative teaching practices with impact that reaches far beyond the professors. This is in large part thanks to an alumnus benefactor who asked the question: "What can we do to make our professors, who are top researchers, into more effective teachers?" Through multiple conversations, the TEI was conceived with funding provided by the alumnus. Since then, other alumni such as Gerald Farnell (PhD'57) and Arthur Allan McAlear (BEng'57) have supplemented this seed funding to catalyze the success of the program. In June 2016, the Faculty launched eLATE (Enhanced Learning and Teaching in Engineering).

2012

JULY

A \$2-million gift received from a benefactor leads to a stimulating discussion around how to improve teaching & learning in the Faculty. The initial idea was to recognize outstanding teachers.



2013

JANUARY

After much discussion and consultation with the University's Teaching & Learning Services [TLS] the Teaching Enhancement Initiative [TEI] is conceived. A part-time Pedagogical Coordinator, Dr. Maria Orjuela-Laverde, is hired to work with professors in the Faculty, and a series of brown-bag lunches are launched for consultative discussions, with 25 professors taking part.



2014

JANUARY

'Mini-grants' of \$1,800 each are awarded to four instructors to support in-class active-learning initiatives. The grants will become an annual call.

MAY

Professor Michael Prince from Bucknell University and Co-director of the National Effective Teaching Institute is the keynote speaker at the 1st Active Learning Conference with his presentation "Active Learning for Busy Skeptics." 122 professors from 6 institutions attended.



eLATE Strategic Objectives

- PROMOTE A CULTURE OF THINKING ABOUT EDUCATION AS A RESEARCHER WOULD.
- ENHANCE A CULTURE OF TEACHING AND LEARNING FOUNDED ON EVIDENCE-BASED PRACTICES.
- DEVELOP A CULTURE OF LIFE-LONG LEARNING AMONG THE ENTIRE ENGINEERING COMMUNITY (STUDENTS AND FACULTY MEMBERS).

2015

APRIL

Arthur Allan McAlear (BEng '57) establishes an Endowment for Education and Research in Engineering that includes funding for active-learning projects.

MAY

Professor Eric Mazur from Harvard University and designer of the *Peer Instruction* teaching method, gives his presentation "Assessment: The Silent Killer of Learning" to more than 300 participants from more than 14 institutions at the 2nd Active Learning Conference.



JULY

Former Dean and passionate educator Gerald Farnell endows a fund dedicated to improving the quality of education through the TEI.



NOVEMBER

Chemical Engineering Professor Anne Kietzig is awarded the Principal's Prize for Excellence in Teaching, Assistant Professor category for her work using eLATE principles and methods.



2016

MAY

Former Provost and Vice-President for Academic Affairs, University of the District of Columbia, President of the Best Teachers Institute and renowned author Ken Bain is the guest speaker at the 3rd Annual Active Learning Conference with a talk on fostering deeper learning, with 255 participants.



AUGUST

The McAlear Endowment for Education and Research in Engineering grants are established for in-class teaching enhancements.

SEPTEMBER

The Teaching Enhancement Initiative evolves into the larger umbrella program 'eLATE', the Enhancing Learning and Teaching in Engineering.

TEACHING INTELLIGENCE

In the spring of 2015, Professor Jeremy Cooperstock was at a teaching crossroads looking for some ideas. He found plenty of them in the peer-based learning techniques of the Teaching Enhancement Initiative.

IN 2015 YOU HAD TOUGH EXPERIENCE IN YOUR ARTIFICIAL INTELLIGENCE CLASS. WHAT HAPPENED?

Jeremy Cooperstock: The students were as bright as any other class I had taught before. But when I gave them a final exam, which was similar in difficulty to previous years, the average was only 30%. It was abysmal. I thought I had failed them.

WHAT DID YOU DO?

Cooperstock: Just after this happened, I received an announcement of a talk by the physicist and educator Eric Mazur, who had been invited from Harvard University. I was skeptical at first, but then I thought, 'OK, I'll listen to what this guy has to say.' The premise was: *'Assessment: The Silent Killer of Learning,'* and his presentation addressed the reasons why "our current assessment practices are inauthentic." It was like a revelation for me. He explained that the final exam is an educational model that impedes learning. The stress, the cramming, the flashcards—they all lead students into a short-term, superficial memorization of the material. It's antithetical to our objective as professors to impart knowledge to our students. So I came into Mazur's talk wondering how to fix the final exam for next year, and I left convinced that the right way to do this was to get rid of the exam altogether!

BUT AREN'T FINAL EXAMS USEFUL TO TEST COMPREHENSION OF THE MATERIAL?

Cooperstock: The notion that memorization is a way to learn things is completely antiquated, given that encyclopedic knowledge is readily available through the World Wide Web. Your ability to be effective in whatever job you do is rarely going to be about memorization, it's about understanding how that knowledge fits together to solve a problem—that's what we need to be teaching.

SO WHAT DID YOU DO IN YOUR CLASS?

Cooperstock: With funding as a **Gerald W. Farnell Teaching Scholar**, I was able to hire two doctoral students to help me to address the learning shortcomings the students were experiencing. On a superficial level, I dropped the final exam in my two courses, Artificial Intelligence and Human-Computer Interaction. Instead, I adopted the strategy advocated by Mazur of peer-based learning. I based the classes on a series of questions that the students had to answer, at first individually, and then in groups, and they still earn marks on second and third attempts at answering the questions. This encourages peer-based learning, with students effectively teaching each other, even while they are being assessed. This dramatically changed the process of learning for the students. They became active learners responsible for their learning. It was beautiful to see it happen.

WHAT WAS THE EFFECT OF THE CHANGES ON THE STUDENTS?

Cooperstock: In one of my courses on Human-Computer Interaction, the students loved how these changes impacted the way they learn, how it engaged them in the material, and what they were remembering. My AI class is still a work-in-progress. The course involves conceptually more difficult material and the textbook is considered tough to penetrate, despite its popularity. The questions the students were asked to work through in class often jumped too quickly ahead of their level of understanding. Based on the initial result last year, we took some more steps. We had some funds remaining from the Farnell award, which the Faculty generously allowed me to use to revise some of the material. We've been putting in place more intermediate questions and adding pointers to video resources to supplement the textbook as a primary source of information. So far this year's AI class is going fabulously well. The students are performing very strongly on the material and I'm thrilled with the results of the process.

“I came into Mazur’s talk wondering how to fix the final exam for next year, and I left convinced that the right way to do this was to get rid of the exam altogether!”

Jeremy Cooperstock, Associate Professor, ECE



SO eLATE - D!

Selina Liu [BEng '15, MEng '17] shares her diary of what it was like to be an undergraduate student in the Faculty of Engineering in the inspired active learning environment of Enhanced Learning and Teaching in Engineering [eLATE].

MONDAY

10AM: I was hyped today after the debate on oil sands production we had in my FACC 400 class. Professor Lawrence Chen was getting us to think creatively about ethical issues in engineering—cybersecurity, 3D-printing, pipelines, etc. We were divided into groups that could choose to create article, video, blog, panel discussion or debate to present the two sides of an ethical question—frankly, the styles of presentation were almost as interesting as the issues themselves.

2PM: I got my first assignment in Professor Jeff Gostick's class, Instrumentation and Measurement. To give us hands-on experience on experiments and peer reviews, he's given us blueprints of a pycnometer, a device using a pressure sensor to measure the density of a sample. We get to go to the hardware store to get material to build it. Should be fun!

TUESDAY

10AM: In Professor Anne Kietzig's Chemical Reaction Engineering class we had a pop quiz mid-way through the class. It's Anne's way of testing what we're learning as we go along. We use our laptops or cellphones to send in answers—diagrams or text. We submit our answers to her, and she can give us feedback right then and there about whatever problems

we might be having. Then she puts us in groups so we can teach each other what we were not getting. It's called Learning Catalytics and it's a great way to stay engaged in the class.

8PM: I prepared for my tutorial later in the week for Kietzig's Chemical Reactions. I watched TA Jonathan Verret's Khan Academy-style screen capture video. He'll be leading the tutorial. He's going to take us through a 'flipped' classroom style, and serve as a facilitator in our active learning.

WEDNESDAY

9AM: My group from the Instrumentation class went to the hardware store this morning to get the materials for our pycnometer. I realize how interesting it is to understand how a piece of lab equipment works from the ground up, rather than just use it. Somehow it makes the measuring process clearer. Plus it's great to have a go at using all the tools in the lab!

1PM: Had lunch with a friend from mechanical engineering and we got talking about active learning. She just had a class with Professor Vincent Chu from Civil in which he presented three simulations of numerical experiments. Apparently it was a great alternative scenario to understanding physical laboratory experiments that are already a part of their curriculum.

THURSDAY

4:30PM: Today in the tutorial with Verret, instead of solving long-answer problems, our tutorials began with a review of relevant material, followed by independent working time where students were free to interact with him and discuss concepts with one another while working on an online quiz. It's so much better for understanding the material than copying down answers from a whiteboard!

FRIDAY

10AM: We analysed the porosity of coffee grains today in Gostick's Instrumentation class with the pycnometer we built. Fabulous hands-on experience, and what a great way also to understand how to make a better cup of coffee. Now we have to go off and write an official lab report based on his explanation of the process. Next week, we'll split off into groups to peer review each other's work. That should help bring up the quality of the report.

“It’s called Learning Catalytics and it’s a great way to stay engaged in the class.”

Sellina Liu (BEng '15, MEng '17)



Hand-in-hand with Gerald Farnell's keen intelligence and his dedication to McGill during his 41 years with the Faculty, was his deep compassion and commitment to giving.

Gerald Farnell (PhD'57) and Norma Farnell

THE CARING COUPLE

Gerald and Norma Farnell have made a lasting impact on McGill Engineering, not only through their commitment to education, but also for their profound sense of compassion. Their generosity continues to touch the lives of many.

Rosie Russo remembers the Farnells very well. Previously an assistant of former Dean Gerald Farnell (PhD'57) in the Faculty of Engineering, Russo was seven months pregnant with her first child when Jerry and his wife Norma showed up at the office one day with an offer of toys and books their grandchildren had grown out of.

"They are both very special people," Russo says. "I still keep those books to this day, even though my daughter is all grown up now —they are so significant for me."

It's just one story that reveals who Farnell the man was. Hand-in-hand with his keen intelligence and his dedication to McGill during his 41 years with the Faculty, was his deep compassion and commitment to giving.

SOLID-STATE INNOVATOR

After graduating from MIT with a Master's in Science, Farnell came to McGill in 1950 as a lecturer and PhD candidate. Farnell served as Professor of Engineering Physics and Electrical Engineering from 1967 until 1972, including terms as Chairman of the Electrical Engineering Department and Dean of the Faculty of Engineering from 1974 until 1984. He retired from McGill as Professor Emeritus in 1991.

Farnell was a pioneer in solid-state device research. He was the first to give a lecture on solid-state transistor technology with George D'Ombrian (Dean of Engineering 1968-1973), and he brought the first computer to McGill in 1957 to the McConnell Engineering Building's fourth floor. In fact when his own research in optical physics required a computer, Farnell simply opted to build one for himself.

During his decades at McGill, Farnell gained a reputation as a dedicated and enthusiastic teacher. In collaboration with colleagues and graduate students, he registered three patents, published 93 papers and earned international recognition for his research on the propagation of Acoustic Surface Waves in anisotropic materials. This led to the development of radio frequency filters, now ubiquitous in mobile phones.

PHILANTHROPIC LEGACY

Jerry Farnell passed away at the Verdun General Hospital on April 30, 2015. When friends, family and colleagues gathered later that May 2015 for a memorial, many spoke of his steadfast desire to help others: the 'Jerry' who was dedicated to his wife Norma when she contracted polio after their first child; the 'Jerry' who worked to help veterans of WWII adjust back into Canadian society; and the 'Jerry' who was a guide to his two children and four grandchildren.

Jerry's and Norma's generosity as philanthropists means that their relationship with the Faculty of Engineering will live on long into the future.

Established by Farnell in 2012, the Jerry and Norma Farnell SURE Award by the Faculty of Engineering is awarded to one or more undergraduate students in a BEng program in the Faculty of Engineering at McGill University who are participating in the Summer Undergraduate Research in Engineering program.

Jerry and Norma's endowments have also helped fund grants dedicated to improving the quality of education in the Faculty through the Teaching Enhancement Initiative.

"He was a wonderful person," Russo says, "not only in how he treated me as his employee, but also outside of the work environment. The Farnells will always have a special place in my heart."

THE MEDA EFFECT



THE MCGILL ENGINEERING DOCTORAL AWARD PROGRAM [MEDA] SUPPORTS GRADUATE RESEARCH THROUGH AN \$8 MILLION FUND THAT HAS BENEFITED HUNDREDS OF STUDENTS.

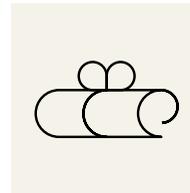
Philanthropy has always shaped Engineering education in McGill's Faculty of Engineering, and alumni gifts have been just as instrumental in building the MEDA program, which contributes to research innovation across Canada. Since its inception, the MEDA program ensures that top international students and professors choose McGill to continue their research.



Between 2007 and 2017 the number of doctoral degrees awarded in the Faculty doubled, from 60 to 120.



Between Fall 2006 and Fall 2016 the number of students enrolled in PhD programs in the Faculty jumped 60% from 356 to 569.



Between 2014 and 2016, 28% of applicants to the Master's program in Engineering had completed their undergrad at McGill.

THE BIO - CONSTRUCTOR

Showan Nazhat's work with collagen gel scaffolds can provide medical science new tools to regenerate human tissues.

While Professor Showan Nazhat looks on, his doctoral student types a few numbers on the keyboard, glances at the computer screen one more time, and then picks up a white needle to demonstrate Nazhat's invention. He puts the needle into a test tube and draws up some pinkish gel. The two men wait patiently by the lab bench as the liquid slowly works its way through the tubes, coming out about ten seconds later as a thin pink line of toothpaste-like substance squeezed onto a Petrie dish.

This is a highly organised, compacted collagen hydrogel, the basic material of replacement body tissue. Since 2006, Nazhat, an Associate Professor in the Department of Mining and Materials Engineering, has been working with various research teams around the world, developing biocompatible materials for tissue engineering and nano-structured scaffolding.

His goal is to give the medical world a tool that can be used to help repair or augment bone and connective tissues in the body.

CONSTRUCTING 3D TISSUE

Collagen is a protein fibre that can be found everywhere in the body. It lives in the spaces between cells and organizes itself into a three-dimensional fibrous 'scaffold' upon which human connective tissue can grow.

By using naturally-derived collagen scaffolds, infused with tissue cells, Nazhat and his team of doctoral students can observe *in vitro* what happens in the cellular regeneration process, and what can be done to increase the speed of that regeneration.

In recent work, Nazhat has been experimenting with controlling the density and fibrous structure of that collagen gel to 'pre-define' the type of tissue structures that can be created [greater alignment of fibres means stronger connective tissue].

His new method adds another level of automation.

"For decades, natural collagen has been used to create these kinds of hydrogel scaffolds," says Nazhat, holding up the material. "But what we have done with our method is to apply mechanical means of controlling the density of the collagen, while completely automating the process."

Ultimately, that automation means that Nazhat can now scale up.

"Collagen hydrogels are by their nature difficult to reproduce in a controllable way," continues Nazhat. "Our new method will allow someone to make multiple samples of different densities and fibrous alignments that can create complex systems. This could be used as a screening tool in drug development as well as *in vivo* use"

LEVERAGING RESEARCH

Nazhat's collagen research for tissue regeneration runs parallel with his work in bioactive glass for bone regeneration. In the latter field, he is currently collaborating with doctoral student William Lepry (PhD'17). Together, they have recently patented a new process of bioactive borate glass generation [see "The Glass Guy" pg. 33].

Nazhat is quick to attribute his success to the quality of the graduate students like Lepry. "My interest is to attract the highest calibre students, and more often than not they come here because they receive Fellowships from the Faculty. For me this also provides great leverage for my research: I am able to reallocate my own financial resources, and their productivity increases the overall numbers."

In 2008, two years after joining the department, Nazhat was awarded one of three inaugural **Gerald Hatch Faculty Fellowships**, established through a \$3-million gift from Dr. Gerald G. Hatch, (BEng'44, DSc'90), to recognize outstanding professors whose work has potential for collaborative, interdisciplinary research.

Thanks in part to the three-year award and its renewal with a \$25,000 annual stipend, Professor Nazhat was able to expand his research and secure other sources of funding.

"It allowed me to take more risks in my research in terms of investing into areas that could generate initial results so important to seed funding, and then to leverage that funding to seek new funding. It has been a highly successful system."

“My interest is to attract the highest calibre students, and more often than not they come here because they receive Fellowships from the Faculty.”

Professor Showan Mazhar



**“My dream is to have a product
that can improve the lives of
hundreds of thousands of people.”**



William Lepny (PhD '17)

William Lepry's patented sol-gel process for making bioactive borate glass is a promising advance for uncanny bone-healing biomaterials.

"I want to put glass inside your body."

That's the way William Lepry (PhD '17) sometimes likes to start a conversation about his work. Lepry, a doctoral student in the Department of Mining and Materials Engineering, slides into a conference room swivel chair somewhere in the labyrinthine Wong Building to explain his research on bioactive glass.

"When people think of biomaterials, glass is usually pretty low on their list," he says. "The cool thing about glass is that it's a material that's been around for thousands of years, and only recently we're discovering its positive effects on the body."

Bioactive glasses are biomaterials that, when implanted in the body, help to regrow bone tissue. Lepry's spent the last four years of his life exploring its potential in a form of borate-focused chemistry.

PERSONAL QUEST

His interest in using these materials for medical application was forged after several knee surgeries stemming from a skiing accident as a 17-year-old. To potentially fill screw holes in his tibia left behind from previous surgeries, the surgeon suggested he might need to perform two surgeries, one to fill the bone graft and one to repair the ligament. When asked why it couldn't be done in one operation, the surgeon replied that the graft material needed at least six weeks to fill the bone graft.

"It got me thinking," Lepry says, "if there was not a faster way." That initial curiosity led him to pursue his doctoral studies. He chose McGill's Faculty of Engineering mostly for the three-year funding he was offered via the **Vadasz Doctoral Fellowships**. Thus began his research into bioactive borate glass for bone tissue repair.

BORATE DREAMS

When placed in simulated body fluid, the calcium and phosphorous in bioactive glass react to form hydroxyl-carbonated apatite (HCA), the inorganic component of bone.

HCA bonds to bone and soft connective tissues, gradually replacing the biomaterial, and acting as a scaffold on which healthy tissue forms.

What's more, the calcium and phosphorus ions that are released during the dissolution process promote healing by stimulating the body's natural healing ability.

Traditional commercialized silica bioglasses or synthetic hydroxy-apatite ceramics, similar to the screws used for Lepry's knee surgeries, are typically slow to resorb and can leave behind the original implant material, which some studies have shown to be problematic.

Bioactive borate glasses, on the other hand, have a low chemical durability, allowing the body to remodel the biomaterial into tissue at a much higher rate, leaving no evidence that an implant was there.

"What makes our approach with bioactive borate glasses unique is the novel production method, the sol-gel process, which increases the glass surface and porosity, allowing for increased reabsorption rates of the biomaterial," explains Lepry. In his experiments, carried out under the supervision of Professor Showan Nazhat, Associate Professor in the Department of Mining and Materials Engineering, this porosity increased over two orders of magnitude compared to traditional glasses, resulting in the onset of mineralization and conversion to bone-like material at a 25-fold increase in bioactivity rate relative to melt-derived borate-based glasses.

"Right now there's not too many drawbacks," says Lepry. "But further testing is needed to see how these materials will react in a living environment."

After submitting a patent for the process in 2014, Lepry and Nazhat are now moving towards animal testing of their invention.

"I've been fortunate to have knee surgeries and recover well from them, but there are better ways to improve bone healing," says Lepry, leaning forward in his chair. "My dream is to have a product that can improve the lives of hundreds of thousands of people."

A COMPLEX DOUBLE - DOUBLE

Maysan Mamoun is looking at how men and women interact [or not] in the coffee shops of Jeddah, Saudi Arabia.

As Maysan Irfan Mamoun (MArch'16) poses for the photographer at the Starbucks on Union, latte in hand, she is visibly happy. A few weeks earlier she submitted her final Master's paper for the Urban Design and Housing Program in the Faculty of Engineering's School of Architecture.

Her paper examined how a Saudi gender segregation law from 1969, which prohibited the mixing of men and women in public space, reshaped the spatial and physical forms of coffee shops—along with the social behaviour of their male and female clients.

"Maysan's work illustrates the interplay between people and the space around them," explained Professor Robert Mellin (MArch'84), who guided her research. "How they interact with that space, and with each other in that context, provides us with a means of understanding social structures."

"I became interested in coffee shops because they are the only public places in Saudi Arabia where you really see social interactions between men and women," says Mamoun, between sips of coffee. "There is not the same culture for public space in Saudi Arabia at the moment. What I hope to do is to use my practice to improve the quality of social interactions in public space in Saudi Arabia."

DOUBLE ESPRESSO

Forging ahead, Mamoun decided to continue with further research at McGill to better understand the relationship of her countrymen and women with their public spaces. Her work is funded by the **Norbert Schoenauer and David Farley Fellowships**.

She travelled back to Saudi Arabia for five weeks in the summer of 2016 to carry out interviews, observe space, and document social behaviour in five different cafés. These cafés were delineated along three gender types: men-only, mixed gender ("family") sections, and—a more recent phenomenon—ladies-only cafés.

One of her case studies, the Medd Café and Roastery, shows how the 1969 Saudi 'Labour Law' directly influenced gender dynamics in the coffee shop.

Medd is a modern, industrial-feel café in a mid-to-high income area of Jeddah that has both male and family sections on different floors. Its five founding partners had studied abroad and returned to their city full of bright ideas about community and coffee, eager to contribute to Jeddah's social and cultural life.

They built their café as a fluid space that brought men and women into the same physical space through a common entrance and ordering area before they went off to their different floors of the café. The idea was for everyone to enjoy seeing the roasting and preparation of the artisanal coffee-making process.

They had not been open long before they got a knock on the door from the authorities. "The Labour Law is enforced by Saudi's *hay'a* or religious police," explains Mamoun. "When they saw the way Medd's space was arranged, they ordered the entire café to be renovated. There's a contradiction between municipal building codes and other governmental institutions like the religious police."

The café was closed for a month to make the necessary changes—reversing the position of their staircase and installing a huge mirror in the upper mixed-gender 'family' section for the clients to be able to see the coffee bean roaster.

This example of the conflict between modernity and tradition in Saudi Arabia figures in the results of Mamoun's study, which showed that the situation of coffee shops in Jeddah is a combination of relations between gender, class and consumption.

"Depending on the café type and geographic location, you can see the effect of gender in the cafés. Construction materials are different, clothes the people wear, topics of conversations, use of language, body posture and social interaction."

Mamoun hopes that her research findings can one day be used in Saudi Arabia in developing evidence-based plans for urban public space. She may well get the opportunity to try—as recently as April 2016 new legislation was passed that diminishes the power of the *hay'a*, perhaps an indication of Saudi Arabia's evolving society.

Susane Havelka and Stéphanie Leclerc are making a difference in their respective fields of Architecture and Urban Planning.

SUSANE HAVELKA - ARCHITECTURE

When **Schulich Scholar** Susane Havelka (PhD Arch '17) traveled to the small Inuit community of Clyde River—on the north-east coast of Baffin Island—to perform architectural research on 'cabin culture' and its place in Inuit life, she had a fortuitous exchange that would add a new dimension to her experience with the Inuit culture.

"A friend in Clyde River had drawn a picture of a traditional snow house with an entrance dome, main dome and back dome," says Havelka. "They described how they used to live in these houses and how it would be wonderful if they could do this once again but without sacrificing modern amenities."

Enter the monolithic dome – an inexpensive and environmentally-friendly air-form that is quick and easy to build, even by those with no experience in construction.

The air-form is inflated with a small fan and then reinforced with urethane, rebar and sprayed concrete – and the monolithic dome is complete except for the interior decoration. Havelka tested the idea out, and after nine days of labour with a couple of helpers she had a permanent building.

"It really looks like an igloo and will last forever," she says. Havelka's idea that the monolithic dome could complement the Inuit's cabin culture has attracted the attention of Kuujuaq-based Senator Charlie Watt, who is interested in developing a prototype for use in Nunavut. Audiences at conferences from Malaysia to Virginia have also been enthused.

"It has received such encouraging responses. I've been really thrilled," she says.

STÉPHANIE LECLERC - URBAN PLANNING

E-waste—such as discarded batteries, tablets, smartphones and other devices—is a huge waste chain that is complex to manage, as it contains a mix of rare elements, precious metals and toxic components. Its management is at the centre of doctoral student and **Schulich Scholar** Stéphanie Leclerc's (MA'00, PhD'16) research in the School of Urban Planning.

"If people throw their e-waste into the regular waste stream, we end up with lots of lead, cadmium or mercury in landfills, and that can pose a risk to water and soil quality," explains Leclerc. "What's more if waste isn't recycled or refurbished through an official regulated program, it may also be sent abroad to disadvantaged countries such as Ghana, where children and young women of childbearing age manually dismantle them, thus exposing themselves to toxicity."

Leclerc's research explores the management of used or end-of-life electrical equipment.

"I'm focusing on the decision-making of people involved in planning e-waste management, as well as the development and implementation of regulations, and the relationship of all the different stakeholders in this process," she says.

Leclerc was approached by the United Nations to serve as a consultant to a global initiative to address e-waste, and has organized a UN-sponsored e-waste management seminar for doctoral researchers around the world. She was also hired by McGill to assess how the university is dealing with its own IT waste. Thanks to Leclerc, McGill now has a process for managing its discarded computers and other e-waste.

Alumnus Les Vadasz [BEng '61], one of the founders of the world- renowned technology company Intel, made a major gift to the Faculty of Engineering in 2006.

His generous contribution provided a huge boost to the MEDA program, inspiring others to help build the fund. During his visit to McGill in September 2016, Vadasz spoke to us about his early years in the Faculty of Engineering, his views on management and entrepreneurship, and what motivates the enduring relationship with his Alma Mater.

YOU CAME TO MCGILL AFTER THE 1956 UPRISING IN HUNGARY, RIGHT?

Les Vadasz : Yes, that's right. The whole thing was very serendipitous. I happened to see a note on a bulletin board that Canada was willing to take X number of university students. I was at a university in Hungary—a first-year student. So I signed up. I had no idea where Montreal was, and I had never heard of McGill. And I ended up here, which was very lucky for me.

MCGILL HELPED TRANSITION YOU INTO CANADA? THERE WAS A HOUSE ON MCTAVISH?

Vadasz : There was a house on McTavish. It's not there anymore. We were housed there at the beginning, and there was an English lady who gave us English lessons for about six weeks. The good part was that she didn't speak any Hungarian, so if you wanted to talk to her, there was only one way. And obviously, you don't learn another language in six weeks—even if you're immersed. But it was very useful as a baseline and it got us started. Then we flew to the winds. Everyone left the house by May, I think, May of 1957.

ENTREPRENEURSHIP HAS ALWAYS BEEN A PART OF THE FACULTY OF ENGINEERING, BUT HAS BEEN GIVEN A BOOST THROUGH THE INNOVATIONS CATALYST IN ENGINEERING PLATFORM. WHAT IS THE RELATIONSHIP BETWEEN TECHNOLOGY AND BUSINESS ACUMEN?

Vadasz : When you start a company, you learn very fast that technology is only one element. It's a much broader issue of creating your market, making your customers successful at using your product, scaling your product to deliver it millions of times—those are all challenges way beyond designing a widget. As long as you have the appropriate guidance for those start-ups and people with some experience in a broader business world who can help you start, by all means, you can succeed. But if it's just some clever technology idea, it's not enough.

ENGINEERS ARE FACING MORE DEMANDS ON THEIR COMMUNICATION SKILLS FROM GLOBALIZED AND INTERDISCIPLINARY PROJECTS NOW. WHAT IS YOUR APPROACH TO YOUR MANAGEMENT STYLE?

Vadasz : I had more of a tendency of probably telling them what to do. As time went on, I sort of turned that more around and expected them to tell me what they wanted to do. I engaged them on their idea and more with questions than with answers. I think that's a bit better than telling people what to do. The problem is time is very much scheduled, and there's only so much time to discuss a subject. There's a point when you have to come to a decision and move on. So you still come to a point where you have to tell someone, "This is the way we're going to do it."

THERE HAS TO BE A DECISION POINT.

Vadasz : Right, but you try to avoid that. That's how my thinking changed as I got a little older.



Les Vadasz (BEng '67) and Judy Vadasz

IS THAT BECAUSE YOU FOUND PEOPLE WERE A LITTLE MORE INVESTED WHEN THEY WERE MORE INVOLVED?

Vadasz : I think it was powerful to give them as much ability to define their workspace as possible. I think the most important element of Intel is recognizing the difference between position power and knowledge power. We tried to instill in our planning process as much knowledge power as position power. And sometimes, we found that the chairman of the company was in a meeting with a new graduate on a technical subject because that new graduate knew as much or more than the chairman of the company about that particular area.

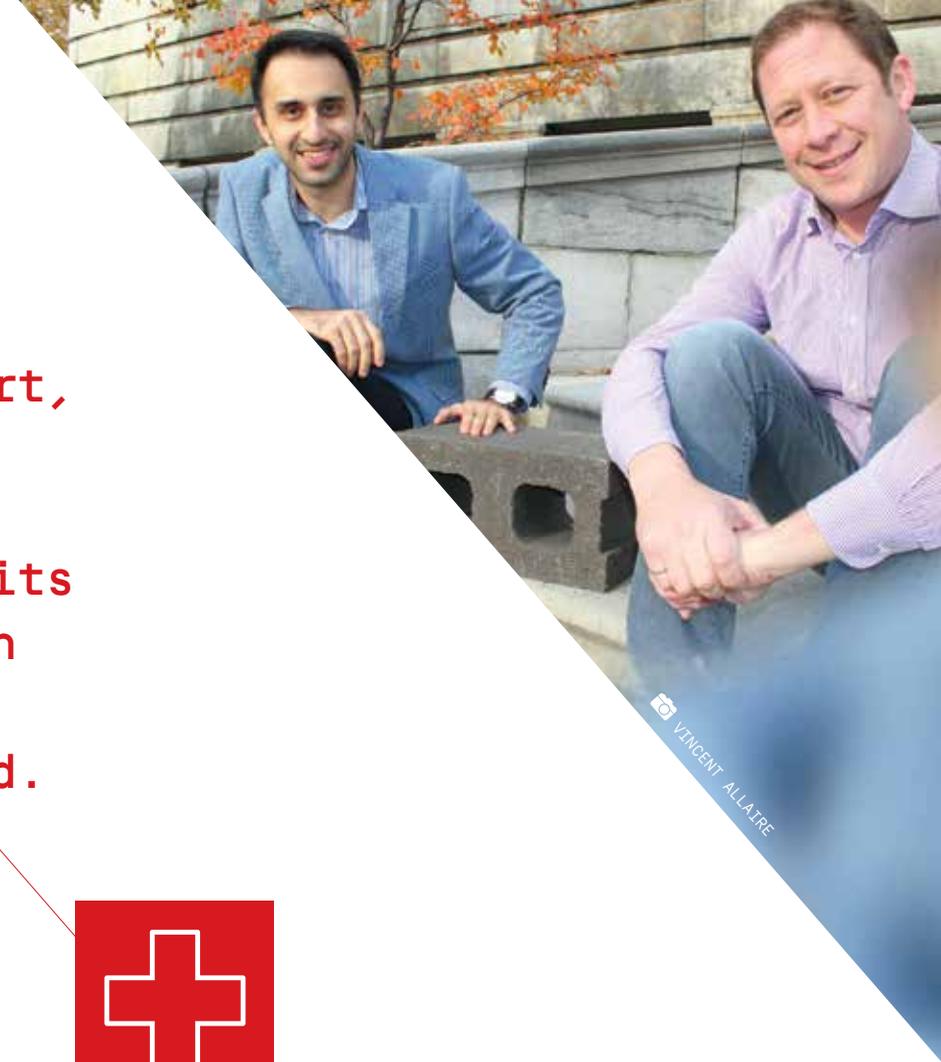
YOU HAVE BEEN INVOLVED WITH THE MCGILL ENGINEERING DOCTORAL AWARDS, A FACT FOR WHICH YOU ARE BEING HONOURED THIS YEAR, WHICH IS THE TENTH YEAR OF THE VADASZ DOCTORAL FELLOWSHIPS. WHY ARE YOU GIVING BACK TO MCGILL?

Vadasz : I don't forget or minimize the opportunities I've had because I had an education, and it happened to be at McGill. So I have almost like an obligation to do something. I remember what it meant to get financial help when I was here. And when you are at the formative stage of your life and career, any little bit of help goes a very long way in getting you a more secure foundation. At least you know where the cost of your apartment is going to come from.

“I remember what it meant to get financial help when I was here.”

MCGILL INNOVATIONS AT WORK

Thanks to alumni support, the technologies being generated in the Faculty of Engineering and by its graduates are having an impact on the lives of people around the world.



VINCENT ALLAIRE



SOFTWARE

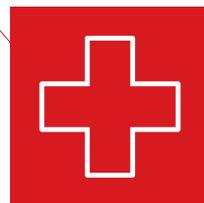
LOCAL LOGIC™

Co-founded by three graduate students from the School of Urban Planning, Vincent-Charles Hodder [MUp'15], Colin Stewart [MUp'14] and Gabriel Damant-Sirois [MUp'14], Local Logic™ focuses on collecting, cleaning and combining data to help travellers, home buyers and consumers make better, more informed decisions when choosing urban locations.

→ www.locallogic.co

SENSEQUAKE (Winner, William and Rhea Seath Awards Competition, 2016)

Sensequake provides sensor-based structural health monitoring (SHM) and seismic assessment of buildings to governmental organizations, engineering firms and the real estate industry. The project was developed at McGill over a period of five years by a graduate student in Civil Engineering, Farshad Mirshafiei [PhD'16], with the help of his brother Mehrdad Mirshafiei [PhD'16]. → www.sensequake.com



PUBLIC HEALTH

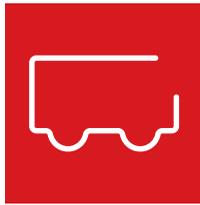
MEACOR (Winner, William and Rhea Seath Awards Competition 2013, Winner, McGill Dobson Cup Start-Up Competition, 2014)

MeaCor is creating a less-invasive heart valve repair device to treat Mitral Valve Regurgitation, a disease that would normally require open-heart surgery. Co-founded by Toufic Azar [PhD'17], from the Department of Mechanical Engineering at McGill University, and Dr. Renzo Cecere of the MUHC, the company received matching capital in 2016 to continue research at McGill University and American University in Beirut. → www.meacor.com

REVOLOOTION (Winner, McGill Dobson Cup Start-Up Competition, 2015)

The sanitation start-up Revolootion makes affordable, no flush toilets to address the global sanitation crisis. The stand-alone units convert hazardous feces to pathogen-free compost that can be converted to a biogas to provide cooking fuel. It is in development by McGill Electrical Engineering student Swathi Meenakshi [MEng'15] and Clara Bitter [BEng'15] (along with Nidhi Shah). → www.therevolootion.com

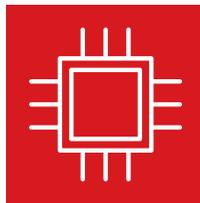
← Mehrdad Mahoutian (PhD Civil'14, left) and Chris Stern (BEng'94), with one of their cement-free, carbon-negative concrete blocks. Their company, Carbicrete, was selected to advance to the 2nd round in the \$20M NRG COSIA Carbon XPRIZE, a global competition to develop breakthrough technologies that convert carbon-dioxide emissions from power plants into high-value products.



TRANSPORTATION

TAIGA MOTORS [Winner, McGill Dobson Cup Start-Up Competition, 2016]

Taiga Motors is developing the world's first production electric snowmobile so that current and future generations can continue to explore all of winter's pleasures in harmony with nature. The company was established by Mechanical Engineering students Gabriel Bernatchez (BEng'15), Sam Bruneau (BEng'14) and Paul Achard (BEng'15). The company plans to launch a limited pre-order in spring 2018 and scale up production to 5,000 units by 2020. → www.taigamotors.ca



ELECTRONICS

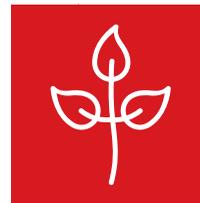
ORA SOUND [Winner, Innovation Award, 2015]

The company Ora Sound was cofounded by Eric Gaskell (PhD Music '16) and his brother Peter Gaskell (MEng'09, PhD'17), a PhD candidate in Electrical Engineering. The company uses graphene—a material lighter, stronger and stiffer than steel—to build unique, high performance loudspeaker membranes. Ora's proprietary nanocomposite formulation provides audiophile quality sound from smaller, more efficient loudspeakers. → www.ora-sound.com

INNOVATION FUND SUPPORTERS:

The innovations being developed by McGill students and graduates are driven by the vision and support of our alumni. Thank you to our Innovation Fund supporters for making this possible.

Michael Barski (BEng'68)
James Brodeur (BEng'56)
Mark Levine (BEng'91)
Arthur Levine (BEng'61)
Pasquale Di Pierro (BEng'76)
Louis Viglione (BEng'78)
William Seath (BEng'52)
Howard Stotland (BEng'66)
Robert Walsh (BEng'65)



SUSTAINABILITY

MOGILE TECHNOLOGIES

ChargeHub was launched in 2012 as a special project of Mogile Technologies to help electric car drivers find public charging stations in the United States and in Canada. The company was founded by three McGill Mechanical Engineering graduates: Simon Ouellette (BEng'14, MEng'16, PhD'18), Olivier Proulx (BEng'07, MEng'14), and Francis DeBroux (MEng'14). So far, the mobile application and website have a community of over 100,000 users.

→ www.chargehub.com

CARBICRETE [Winner, William and Rhea Seath Awards Competition 2016, Runner up, McGill Dobson Cup Start-Up Competition, 2016]

Producer of patented technology that allows manufacturers to produce cement-free, carbon-negative concrete. The technology was developed by four McGill graduates: Mehrdad Mahoutian (PhD Civil'14) Chris Stern (BEng'94), Yuri Mytko (BA'98), and Mario Venditti (BEng'93, MBA'07).

→ www.carbicrete.com

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STUDENTS RECEIVED ENTRANCE SCHOLARSHIPS

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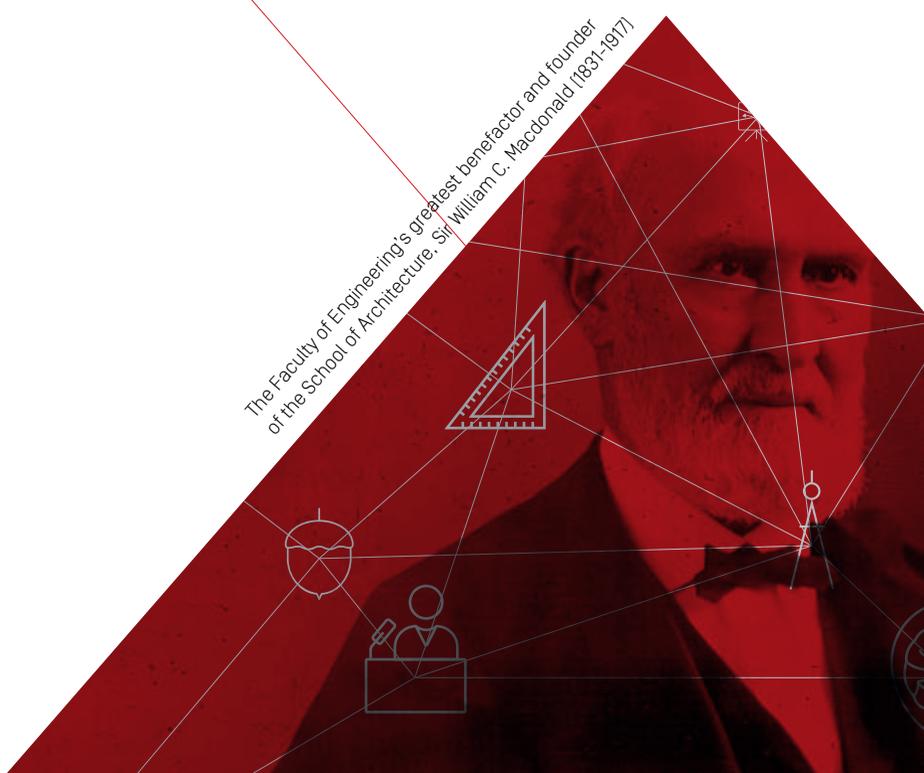
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157

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- Bioengineering
- Chemical Engineering
- Civil Engineering and Applied Mechanics
- Electrical and Computer Engineering
- Mechanical Engineering
- Mining and Materials Engineering

6

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- Architecture
- Urban Planning

2

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3

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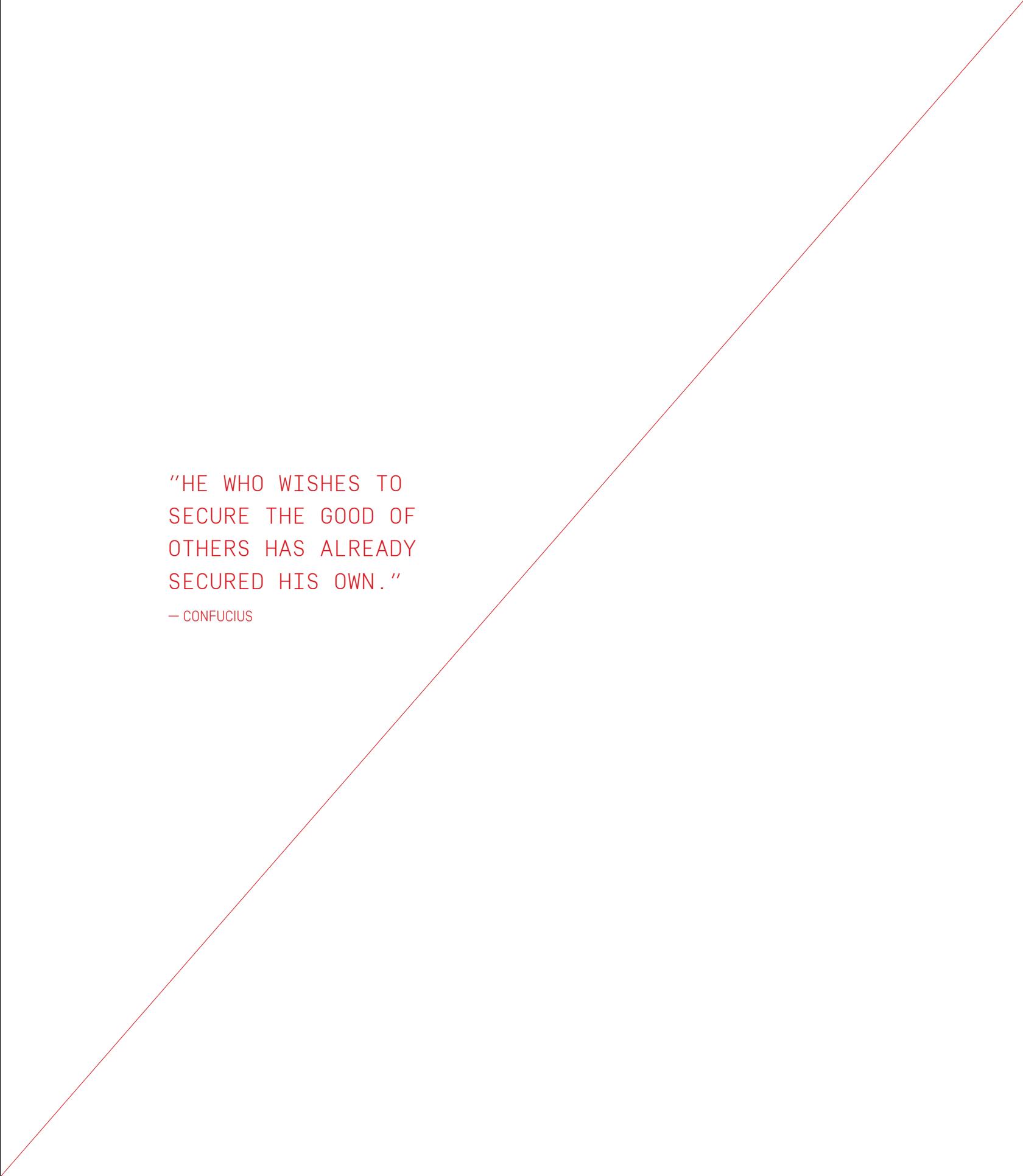
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