

MOMENTUM MOMENTUM MOMENTUM

Issue 5 — Spring 2017
THE ENTREPRENEURSHIP ISSUE

Alumni & Industry Magazine
Mechanical & Industrial Engineering
University of Toronto



"It's the most
emotionally
intense experience
of my life. It can
be so glamorous,
and at the same
time so lonely."

Khalil Zahar
PAGE 29

ISSUE 5

The Entrepreneurship Issue

—

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MESSAGE FROM THE CHAIR

"Launching a successful company requires one to be truly innovative, to be efficient, and to be persistent—all of which are values and skills of an engineer."

As U of T Engineering increasingly becomes one of the city's most prominent, thriving hubs for startups, we at MIE are immensely proud of the many significant ways our community is contributing to the culture and success of entrepreneurship at the university.

As you will read in this issue of *Momentum*, our department encourages an innovative and entrepreneurial spirit that has driven many of our students, faculty and alumni to start their very own successful companies.

It is no coincidence that engineers would be successful at business; engineering provides a valuable foundation. Launching a successful company requires one to be truly innovative, to be efficient, and to be persistent—all of which are values and skills of an engineer.

In this Entrepreneurship Issue, we are proud to showcase some of the extraordinary entrepreneurial stories that have come out of MIE. This includes a

feature on one of our pioneering faculty members, who turned his research into a globally renowned company. You will also read about three trailblazing alumni, whose business ideas led them to be founders of some of the most well-known and influential companies in Canada and the world. And lastly, you will learn more about four young entrepreneurs—one of whom is still a student—making an impact in a range of areas, from mental health to sports, with their startups.

These stories of entrepreneurial excellence will surely grow in number when the Centre for Engineering Innovation & Entrepreneurship (CEIE) opens. With the CEIE building becoming the new vibrant hub for innovation and entrepreneurship, I am confident that our MIE community will continue to play a vital role.

I hope you enjoy this latest issue of *Momentum*, and encourage you to continue staying in touch with us at future events at the Department of Mechanical & Industrial Engineering.

Jean W. Zu
Professor & Chair

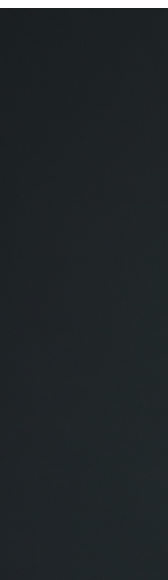




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FROM TOP-LEFT:
Chakameh Shafii, Prof. Emeritus Andrew
Goldenberg, Eva Lau, Nick Di Donato, Som
Seif, Hanna Janossy





THE PIONEER THE PIONEER THE PIONEER

Professor Andrew Goldenberg is among the most successful researcher-turned-entrepreneurs at U of T Engineering.

By Daniel Rouse

Mr. Rouse is a writer and editor at *The Score*.





"Everybody was asking 'Are you cutting the university short in order to do commercial work, or are you challenging the academic establishment?' The latter."

While many are plagued with the winter blues, Professor Emeritus **Andrew Goldenberg** grits his teeth and charges through the whip and bite of the wind which cools above Lake Ontario.

He attributes his alertness to the 10-kilometre runs he does every other day—he's completed several half-marathons—and to why he's one of the brightest minds in robotics since finishing a PhD at the University of Toronto over 40 years ago. It wasn't long after graduating until he was snapped up by SPAR Aerospace Ltd.

"It was 1975 when I was hired, and that is still today one of the most amazing projects that I ever worked in. That was one of a kind, and Canada was at the forefront," says Goldenberg.

The main assignment was creating Canadarm, a revolutionary robotic arm which attached to space shuttles and was able to bring defective satellites back down to earth. The mechanism was huge—around 64 feet in length—and further fed Goldenberg's enthusiasm for innovation and solving large-scale problems with sophisticated, intricate patterns.

"That robotic arm propelled me into robotics," he reflects. "I know now from the inside how useful it was; I was lucky to be hired by that company. It set me up for the rest of my career."

Goldenberg bemoans various factors in that field which prevented Canada from taking its deserved mantle as one of the biggest players in space exploration. Instead, while Canada's outreach there mainly remained grounded, it launched Professor Goldenberg's stratospheric findings elsewhere in robotics.

TAINTED BY PRACTICAL WORK

He was drafted in talk on the blossoming world of robotics at Centennial College in 1981, before being headhunted by U of T later that year for its new position dedicated to that field. The university's vision was certainly enterprising, but Goldenberg found he had to get his hands dirty in industry in tandem with his academic endeavours.

"I had already been tainted by practical work," he explains. "When you're a professor you deal with theory, mathematics, concepts, and everything went mainly on published papers. Today it's somewhat different; then it was fun, but I felt I'm missing something."

That insatiable appetite to learn and create led him to identifying issues at companies such as IBM, and soon enough he was scribbling the designs to construct mechanisms which would shape the future of various industries. With no set plan except a determination to satisfy the demands of an increasingly robot-conscious world, Engineering Services Inc. (ESI) was born in 1982.

"Everybody was asking 'Are you cutting the university short in order to do commercial work, or are you challenging the academic establishment?'" The latter."

He eventually housed ESI in the building next door to his professorial office, seemingly manufacturing more hours in the day to oversee the largest number of graduate students at U of T Engineering (46 PhD and 64 MASc), produce an impressive number of publications, acquire lots of money for research, and preside over a growing, thriving business that simply grew via word of mouth. His move into business was largely unprecedented and not welcomed by some sections of academia.

"I got accused of undermining the academic purity by some—today's just the opposite," he shares.

IMPACT

It's no surprise that ambitious businesses have scrambled to acquire Professor Goldenberg's patterns and expertise over the years. ESI's accomplishments include explosive and ordnance disposal robots for the Royal Canadian Mounted Police, a model for robot-assisted MRI-supported prostate surgery and other medical breakthroughs, as well as many other robots which have aided projects as varied as rovers for Mars to the maintenance of underground gas pipes.

In 2000, ESI's devices used by the biotechnology research sector around the globe were purchased by an Ontario-based public company, but the financial windfall wasn't going to tempt Goldenberg into early retirement. He instead, in his words, "kept on doing

the same thing," when in fact he continued to inspire U of T students, supervise a staff number which had bloated to 25 at ESI, and then manage the same number of employees at the biotech-dedicated Virtek Engineering Science Inc.

Through contacts in China, Professor Goldenberg eventually sold his businesses to Shenzhen Anzer Intelligent Engineering Co., Ltd in May 2015, but remains solidly involved in the business of the purchaser. The revolutionary start-up which began with Goldenberg and a few others cramped into offices leased at U of T had become a public company.

Still, the Romanian-born and Israeli-raised visionary isn't one to step back and admire his achievements. "I'm not happy with professors when they are considered as experts where technology and business meet. The same applies to government bureaucracy. And I'm never happy with myself when people make out I know everything," he says. "I know in-depth university work, the practice and business of robotics, but I am encountering new challenges daily. I haven't done it all."

MAKE A MARK

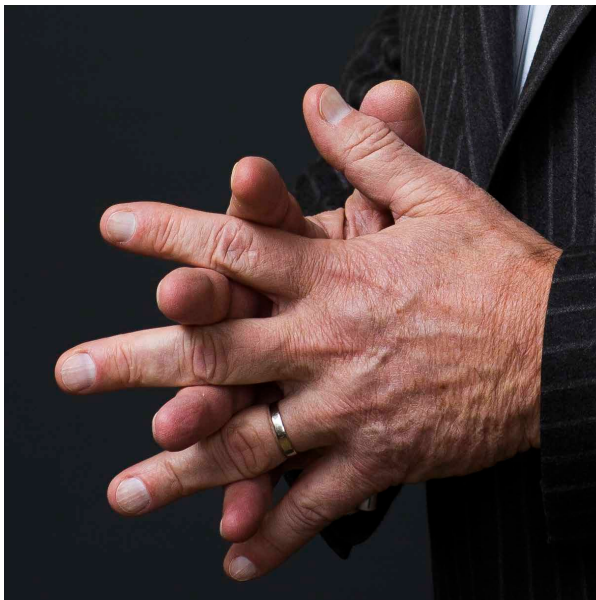
In 2010, Goldenberg stepped away from U of T aged 65, but still works with graduate students as a Professor Emeritus. He's therefore abreast of what the new engineering breed are like, but warns they'll have to develop individually to be a force in an incredibly competitive world.

"The entrepreneurial bug is everywhere. It's wild. The worst is for a person to look around and say 'Oh, I like what he does, I'll do the same.' This is the worst," says Goldenberg, noting that every young person has to find their own niche which suits their personality.

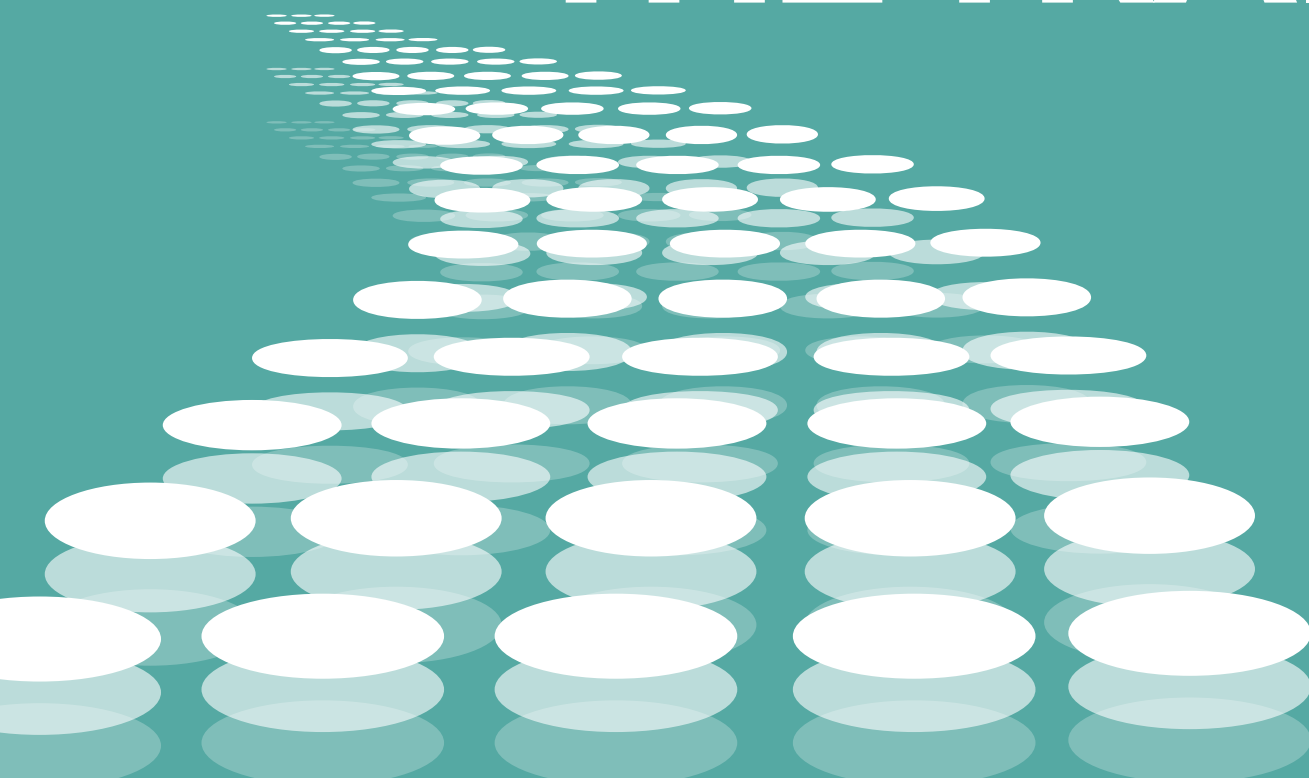
Be it in the philanthropy work he's embraced with his wife Aviva, or assembling the next revolutionary cog in the abounding world of robotics, Professor Goldenberg stresses how important it is to "make a mark." The engineering guru and entrepreneur has cut an inspirational path which began with plucking satellites from space in the mid-1970s, but even now some bright-eyed budding business minds will struggle to keep up with this marathon-notching "nutcase."

"Personality-wise, I never follow. I need to understand to trust myself and proceed as I see fit. My gut feeling, cerebral self-conversations while running, and chats with my wife are my partners. If I pique the interest of one of my partners, I have to find out more. So I do become a pain in the neck, even to my business partners, because I question everything," he admits.

"I always look ahead—not until the end of the week, but to the next undertaking." ●



THE TRAILBLAZ
THE TRAILBLA
THE TRAILE



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*Ambition drives three alumni to chart
their own paths to success.*

By Mark Witten

Mr. Witten is a freelance health and science writer in Toronto.



"When you are in your own business, there is no limit on how far you can go."

When **Nick Di Donato** (IndE 8T1) studied engineering at U of T, he showed the kind of hustle, drive and versatility that are the keys to his success as a hospitality and entertainment entrepreneur.

As founder and CEO of The Liberty Entertainment Group, Di Donato has built a roster of restaurant, nightclub and special event venues that include Toronto's Liberty Grand historic ballroom, The Rosewater supper club, Cibo Wine Bar, Tattoo Rock Parlour, and a revitalized Casa Loma.

While hitting the books by day as a student, most nights Di Donato played drums in a rock band or served patrons in his parents' Italian restaurant, Lorenzo's. Stretching the limits of what he could do in 24 hours for four years wasn't easy.

"I found it challenging always working nights and being in class at 8 a.m.," recalls Di Donato. But his experience paid off at graduation—he was offered 11 positions with top companies—and through three decades as a hard-driving nightlife entrepreneur.

Di Donato opened his first restaurant, the P.M. Toronto sports bar, in 1986, while working at Imperial Oil managing construction projects. His engineering background helped him to design the flow, inventory control and scheduling systems for that restaurant and his many restaurants that followed.

"When you are in your own business, there is no limit on how far you can go. I knew from my parents' experience that restaurants are a volatile business and I needed financial stability in my life. You don't want to have one type of stock in your investment portfolio. I wanted to create a diversified portfolio of hospitality businesses with casual and fine dining, nightclubs and event spaces," he says.

His engineering design skills and construction experience proved to be a competitive advantage. Liberty Entertainment undertook the restoration of historic properties into restaurants and special event spaces: converting the Consumers Gas building (circa 1850s) into the Rosewater; the 100,000-square-foot

heritage building at Exhibition Place (constructed 1926) into the Liberty Grand entertainment complex; and 40,000-square-foot Coral Gables Country Club (constructed 1924) in Miami into an elegant special event space.

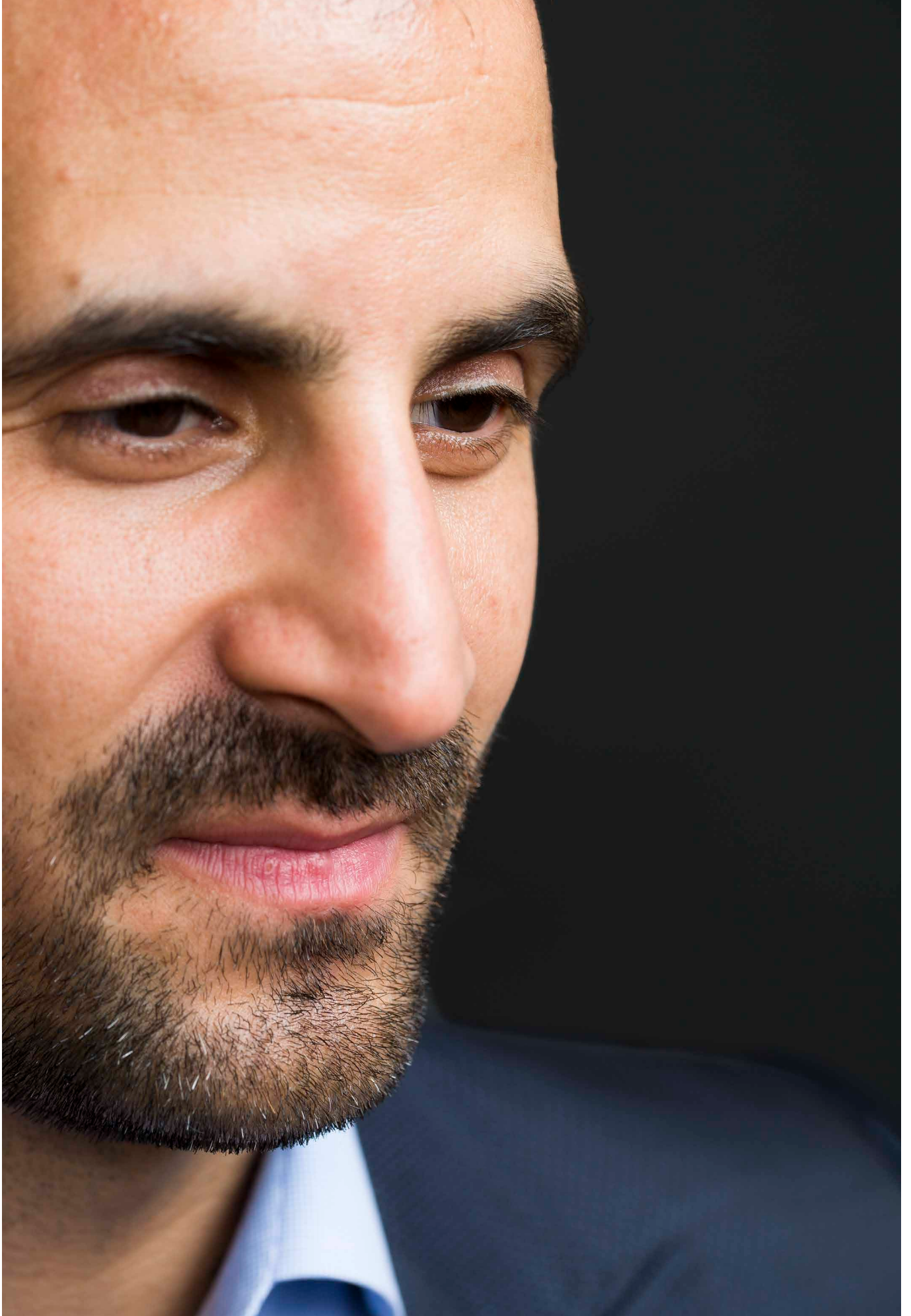
Rather than hiring and paying outside engineering and construction firms to manage the technical challenges of upgrading historic properties, Di Donato did it himself.

"I'm very hands-on and can find different, efficient ways of doing things and this has saved us a lot of money. I have the confidence that we will stick to the budget because I come up with it," he says.

The lavish transformation of heritage properties into alluring restaurants and event spaces that blend classic and contemporary features has helped make his venues unique. "People gravitate to historical structures that create a special, unforgettable ambience. It differentiates the company over the long-term. Nobody will build another Liberty Grand or Casa Loma," says Di Donato, who also sees potential growth in tourist attraction facilities with the advent of Casa Loma.

Di Donato's motto as an entrepreneur is: "Delegate in an intelligent way. Put the right people in the right place." His brother Pat, who trained in hotel and restaurant management, runs the company's food and hospitality operations. His wife Nadia, who trained in visual communications, has designed every restaurant since the Rosewater as well as the interiors for the event spaces. "To be successful in the hospitality business, the creativity you bring to it is huge. Nadia creates the magic in our spaces," says Di Donato.

His restaurant roots are driving the future growth of the business through the expansion of his Cibo Wine Bar, with its rustic Italian fare, into Coral Gables, Ft. Lauderdale and South Beach in Florida. "We're bringing our Canadian-Italian cuisine, true to its roots, into the U.S. People love to see the fresh pasta made from scratch. In South Beach, we're doing 700 covers a night, which is mind-blowing," he says.



Som Seif (IndE 9T9) has never been one to go the beaten path. When Seif started in civil engineering at U of T, he wanted to be an architect. But as he talked to more local architects, they all warned him there was no money in the field.

“Business was my next big passion, so I switched to industrial engineering,” says Seif, who launched and built Claymore Investments Inc. into an exchange traded fund (ETF) powerhouse in Canada, before selling it to BlackRock Inc. in 2012. He’s currently the founder, president and CEO of Purpose Investment Inc.

Seif decided in fourth year to go into investment banking. But engineering grads weren’t on the radar of employers—applications often stated that only MBAs need apply. Seif applied anyway and persuaded executives at RBC Dominion Securities that an engineer could offer a powerful set of analytical and technical problem-solving skills.

who was inspired by a journal article on the concept of fundamental indexing written by UCLA professor Rob Arnott in 2004.

Seif had the idea of creating low-cost ETFs that combine the best of passive and active investing to perform better over the long-term than conventional, market-cap index funds. Arnott’s indexing approach appealed to him because it tracked cash flow, sales, book value and dividends, and rebalanced its funds based on disciplined rules.

Seif called Arnott, flew down to California, and took him on as a partner to help build Claymore’s fundamentals-based ETFs, including the flagship Claymore Canadian Fundamental Index.

Claymore grew to \$8-billion in assets. The 2008 financial crisis was a springboard for the company’s growth, as investors became more willing to switch from high-cost active money management to low-cost ETFs.

"I had skin in the game and had to ask myself, what is the right way to do this? Engineering school taught me how to learn and look at problems from a different angle."

The high-octane grad also sold them on his leadership abilities and willingness to work harder than anyone else, which he demonstrated by logging 80- to 120-hour weeks on deals. “I was a beta test for RBC. They said I was high beta, meaning high risk and high payoff, because if it worked out, it would work out really well,” he says.

At 25, Seif decided that what truly excited him would be to create a business to propel his own ideas forward, bring them to fruition, and make millions. He set a deadline of doing it or leaving RBC by 30.

Seif seized the opportunity two years later when one of his U.S. clients, Claymore Group, asked if he would like to build a business for them in Canada.

Claymore gave him a blank slate. “I had skin in the game and had to ask myself, what is the right way to do this? Engineering school taught me how to learn and look at problems from a different angle. I stepped back and thought hard about the problems in the investment industry and the solutions investors needed,” says Seif,

“If you want to be a disrupter, you need your clients to be disrupted. We went from \$1-billion in assets under management in 2008 to \$4-billion in 2009,” says Seif.

After Guggenheim Partners bought Claymore in 2008 and sold the company off again in 2012, Seif took a break to travel with his family before launching Purpose Investment Inc., which he owns and controls.

Purpose has grown to \$3-billion in assets in its fourth year of business, surpassing Claymore’s growth to \$1-billion over the same period. Seif seeks to differentiate the company through an investment approach grounded in managing risk, through products that give clients access to alternative investments with low fees and more transparency.

“Our focus is on making clients happy, not just beating the market. Clients want good returns and no loss of capital. We have to continually lead by innovating and asking, how can we be doing it better?”

"We want to help build the Canadian tech system to be one of the best in the world."

Entrepreneurship is an adventure that **Eva Lau** (IndE 9T2) has shared with her husband, Allen Lau (ElecE 0T6), ever since she launched her career in 1992 at a tiny startup.

Eva is the Managing Partner and Co-Founder, with Allen, of Two Small Fish Ventures, which invests in early-stage Internet companies in Ontario. She was also Head of Community and Content for Wattpad, an online storytelling community with 45 million monthly users that was co-founded by Allen.

Despite her upbringing in a traditional Chinese family that valued getting a good degree and a stable job, Eva was attracted to broader possibilities while taking an entrepreneurship course by Professor Emeritus **Joseph Paradi**.

"It planted a seed in my head," says Eva, who joined Delrina as a quality assurance analyst, a software company co-founded by another IndE grad, **Bert Amato** (IndE 8T1).

Her time at Delrina was also a crash course in how to build a startup into a world player, which grew from 30 employees when she joined to 700 three years later, when the company was sold to Symantec for \$415-million.

"Bert was one of my mentors, and I saw him build and grow the company," says Eva, whose husband followed her to Delrina in 1993 after a stint at IBM.

Like Eva's parents, Allen's also "freaked out" when he left a well-paid job at a large company. But the heady, explosive run at Delrina shaped them both as entrepreneurs.

"Riding that rocket ship was a life-changing experience. There I learned to be ambitious enough to aim for global scale and fearless enough to take on the toughest competitors. If you build an amazing product for a global market, the sky is the limit," says Allen.

For several years Eva worked as director of product development at Toronto accelerator Brightspark Labs, where she mentored and helped tech startups to build viable products. Her experience helping entrepreneurs bring high-risk ideas to fruition proved useful when Allen wanted to turn his idea for a mobile reading app into a global business.

"I worked with a bunch of great entrepreneurs at Brightspark and saw how they built their businesses. When Allen wanted to leave his full-time work to start Wattpad in 2006, I said, 'go for it.' This was a once-in-a-lifetime idea and I didn't want him to have any regrets," she says.

The couple agreed to put their finances on the line to pursue their dream. Wattpad signed up only 1,000 users its first year, earning just \$2 in ad revenue from Google. It looked as if the Laus were going to have to sell their house to keep Wattpad going, but Eva had the risk tolerance and faith to urge that they stick it out.

In 2009, after Wattpad had built up a few hundred thousand users and raised money in the first seed round of financing, she joined the company full-time to help build the community and enhance user experience. Since then Wattpad has raised US\$67-million in funding, and grown to 130 employees.

"Allen and I have complementary expertise and skills. Because of my earlier experience in product development, working with users and listening to their needs, we were able to innovate solutions to delight users," says Lau.

Building the community and content helped to transform Wattpad from a reading app to an entertainment firm. "We've scaled our company from a few hundred thousand to 45 million users. Such a large crowd of engaged users allows us to spot popular stories much faster. We take popular stories with a fan base and help them go further in different media formats like books, TV shows, movies and video games," says Eva.

In 2014, Eva left Wattpad to run Two Small Fish Ventures, an angel investing firm she co-founded with Allen. The firm has invested in Internet startups such as Hubba, a product information sharing network; Voucher, a mobile gifting app; and BenchSci, a science data sharing platform.

"We've learned many things about building and scaling up companies through our careers. It's an absolutely fantastic, scope-broadening experience to share what I've learned with these entrepreneurs," she says.

"We want to help build the Canadian tech system to be one of the best in the world." ●



HONOURS & AWARDS

FACULTY

American Association for the Advancement of Science (AAAS): Fellow
Kamran Behdinin
Yu Sun

American Society of Mechanical Engineers (ASME): Honorary Member
Cristina H. Amon

Canadian Society for Mechanical Engineering (CSME): Fellow
Nasser Ashgriz

Canadian Academy of Engineering (CAE): Fellow
Murray J. Thomson

Canadian Society for Mechanical Engineering (CSME): Robert W. Angus Medal
Kamran Behdinin

Engineering Institute of Canada (EIC): Fellow
Kamran Behdinin

Engineering Institute of Canada (EIC): John B. Stirling Medal
Jean Zu

Engineering Institute of Canada (EIC): Sir John Kennedy Medal
Cristina H. Amon

Hart Professorship: Percy Edward Hart and Erwin Edward Hart Professorship
Tobin Filleter

The Institute of Electrical and Electronics Engineers (IEEE): A.G.L. McNaughton Gold Medal
Andrew A. Goldenberg

Natural Sciences and Engineering Research Council of Canada (NSERC): 2015 E.W.R. Steacie Memorial Fellowship
David Sinton

Ontario Ministry of Research and Innovation (MRI): Early Researcher Award
Edmond Young

Ontario Ministry of Research and Innovation (MRI): Early Researcher Award
Tobin Filleter

Royal Society of Canada (RSC): College of New Scholars, Artists and Scientists
Hani Naguib

Royal Society of Canada (RSC): Fellow
Javad Mostaghimi

ALUMNI

2016 Douglas R. Colton Medal for Research Excellence
Reza Nosrati (MechE PhD 1T6)

2016 Engineering Alumni Association Awards: Engineering Alumni Hall of Distinction Award
Paul Henderson (EngBus 5T7)
Ronald Bertram Sidon (IndE 6T6)
John Weber (MechE 7T9)

Canadian Academy of Engineering (CAE): Fellow
Elizabeth Croft (PhD MechE 9T5)



The awards displayed are from the period of December 1, 2015 to December 1, 2016. We apologize if your award is not listed. Please contact us at momentum@mie.utoronto.ca with details about your award and we will add it to our online record.

Government of Canada: Vanier Canada Graduate Scholarship
Moien Alizadehgiashi
Advisor: Axel Guenther

MIE Graduate Research Discovery Award: MIE Graduate Research Discovery Award
Reza Nosrati
Advisor: David Sinton

MIE Graduate Research Discovery Award: MIE Graduate Research Discovery Award
Matthew Ooms
Advisor: David Sinton

MIE Graduate Research Discovery Award: MIE Graduate Research Discovery Award
Zhengbao Yang
Advisor: Jean Zu

National Association of EMS Physicians (NAEMSP): Best Poster Abstract Presentation
Christopher Sun, Derya Demirtas
Advisor: Timothy Chan

UNDERGRADUATE STUDENTS

Ontario Professional Engineers Foundation for Education: Scholarship
Haya Elaraby, Katherine Lonergan

U of T Engineering Entrepreneurship Hatchery: First Place at Hatchery Accelerator competition
Kyle Bimm, Bryan De Bourbon, Sam Fang, Bonny Khanna

University of Toronto: Gordon Cressy Leadership Awards
Jaquelyn Monis Rodriguez, Rong Yao

Women in Science and Engineering (WISE): First Place at WISE Conference
Amanda Persaud, Eashita Ratwani, Nadia Khan

STAFF

Faculty of Applied Science & Engineering: Quality of Student Experience Award
Carla Baptista

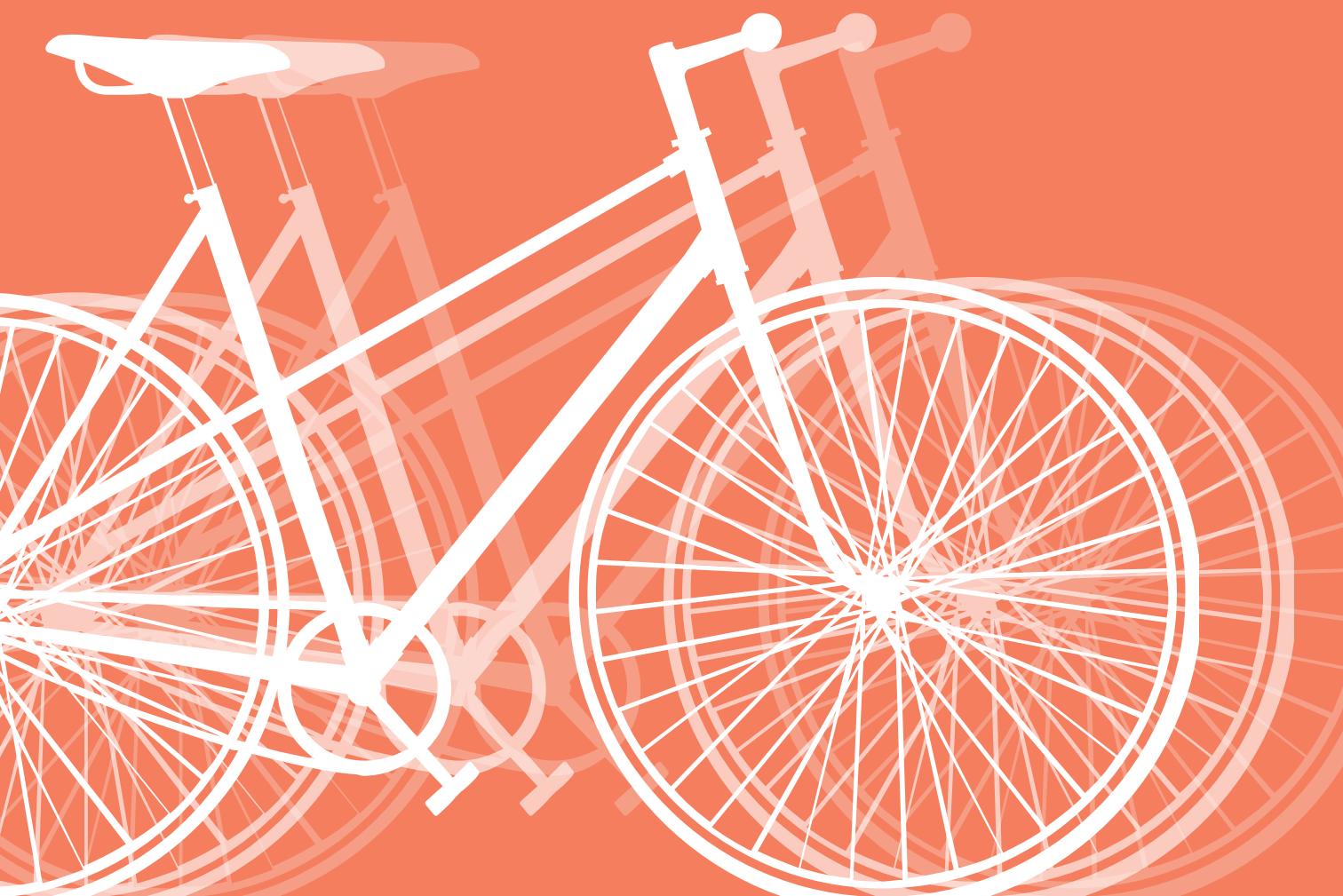
Engineering Institute of Canada (EIC): John B. Stirling Medal
Marc Rosen (MechE 8T1, MSc 8T3, PhD 8T7)

Professional Engineers of Ontario (PEO): Ontario Professional Engineers Award
Ted Maulucci (MechE 8T9), John Yeow (MSc MIE 0T0, PhD MIE 0T3)

GRADUATE STUDENTS

American Heart Association: Young Investigator Award
Derya Demirtas (IndE PhD candidate)
Advisor: Timothy Chan

Best Student Paper Award: 2016 Human Factors and Ergonomics Society, Surface Transportation Technical Group
Jeanne Xie
Advisor: Birsan Donmez



Four rookies share what it's like to chase opportunity.

By Brian Tran

—
Mr. Tran is a freelance writer and graphic designer in Toronto.

STARTS
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"We're taking a leap of faith that Canadians are going to stand up and get the help they need."

She radiates an easy self-confidence. You'd never guess that **Shakameh Shafii** (MechE 1T2, MASc 1T4), like countless other Canadians, struggled with mental health.

"I've had anxiety all my life," Shafii says, who sought professional help after stress started to interfere with her life.

She quickly discovered that it was hard to find a therapist with whom she felt a rapport, an essential factor when patients open themselves up to complete strangers. Another problem was that few therapists offered sessions in the evenings or weekends, making it difficult for her to schedule appointments.

Shafii eventually got the treatment she needed and credits therapy with helping her to manage her fears and to be comfortable taking risks. "I was able to have the kind of enjoyment of life that I actually never had," she says.

Determined to make the experience of treating mental health easier for others, Shafii launched TranQool in February 2016.

TranQool connects individuals struggling with mental health with a psychologist through its online platform and enables secure video sessions. This means people can receive treatment from the privacy and convenience of home. To improve the match between patient and service provider, TranQool matches people based on preferred language, personality and availability.

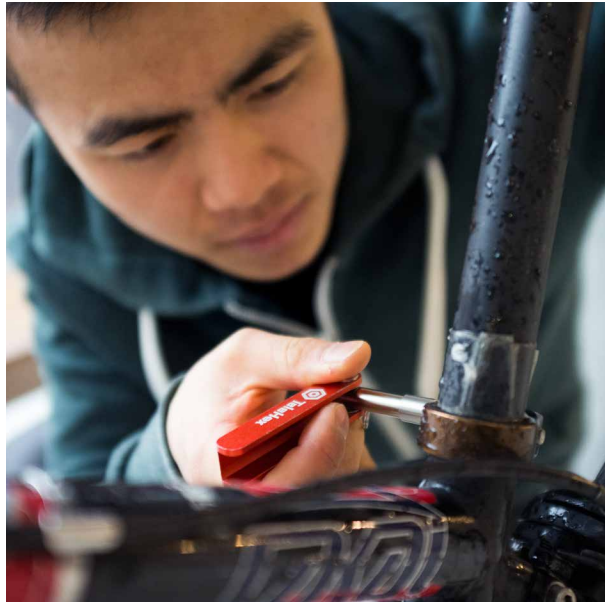
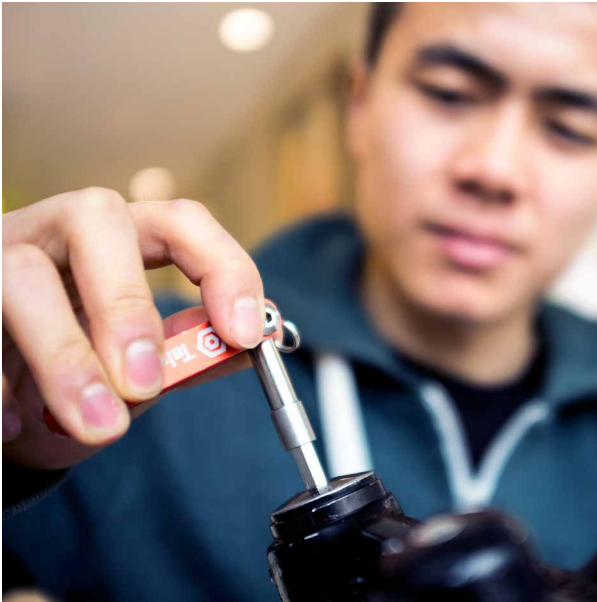
Her company partners with therapists who want to take on clients during off-peak hours, as a means to supplement their caseload, rather than replace it. Video sessions reduce overhead costs, enabling TranQool to offer high-quality counseling at rates lower than traditional bricks and mortar services.

Shafii's vision is to make tackling personal mental health issues comfortable, accessible and affordable for all Canadians.

TranQool has now raised seed funding, allowing the company to grow after Shafii and her co-founders bootstrapped their first year. Fundraising was a test of nerves. But Shafii's belief in her fledgling startup never wavered,

"We're taking a leap of faith that Canadians are going to stand up and get the help they need. If TranQool can be any part of that, for anyone, it would be so fulfilling for all of us here," she says.

*Her advice to aspiring entrepreneurs:
Be able to regulate your emotions. Have self-
confidence—people are depending on you.*



"Do you know that guy who comes up with an idea for an app and approaches software engineers to make it (in exchange for half of the profits) because he can't code? That didn't have to be me."

"Mountains, clean lakes and good cheese," is how fourth-year student **Peter Wen** describes the sights and smells of Zurich, Switzerland, where he's currently doing his PEY. With its developed biking infrastructure, the alpine city is a cyclist's paradise.

Wen, a cycling fanatic, invented TeleHex in 2015, an ultra-light, ultra-portable telescopic hex key. For cyclists like him, this means fewer tools to own and faster tune-ups. Since blasting through his Kickstarter campaign last year, Wen has partnered with a manufacturer in Nanjing, China and put his product on shelves at a bike shop in the Greater Toronto area.

With investment dollars flowing into software and internet-connected devices, pure hardware

innovations have grabbed fewer headlines. Despite this trend, Wen saw a business case for a self-adjusting hex key targeting a consumer niche he knew well, "I was lucky to be a cyclist because I quickly saw the opportunity to build a product like TeleHex," he says.

Wen's time at U of T is already paying off, "Do you know that guy who comes up with an idea for an app and approaches software engineers to make it (in exchange for half of the profits) because he can't code? That didn't have to be me," he says.

*His advice to aspiring entrepreneurs:
Think about what you know, and do, better than
everyone else—that's your advantage.*

"A lot of what I studied in Industrial Engineering has proven to be really useful at Palantir. From human-computer interaction, to programming, to operations research, I have used every course's content at some point."

It takes an eternal optimist like **Hanna Janossy** (IndE 1T3 + PEY, MEng 1T4) to see opportunity where others see defeat.

Up until 2015, Janossy was building Syncadian, a company whose mission was to help people manage fatigue through technology. She tested ideas ranging from a jetlag app for travellers to a do-it-yourself melatonin testing kit.

But Janossy faced the realization after months of grueling development that the market was too underdeveloped to justify pressing on. "I felt grateful.

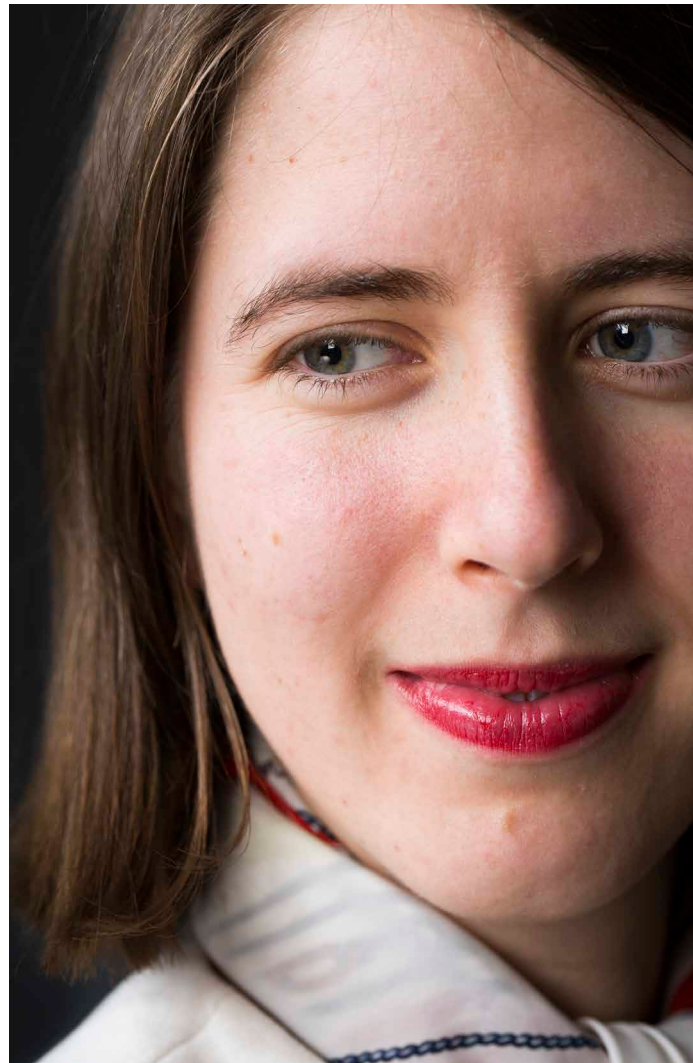
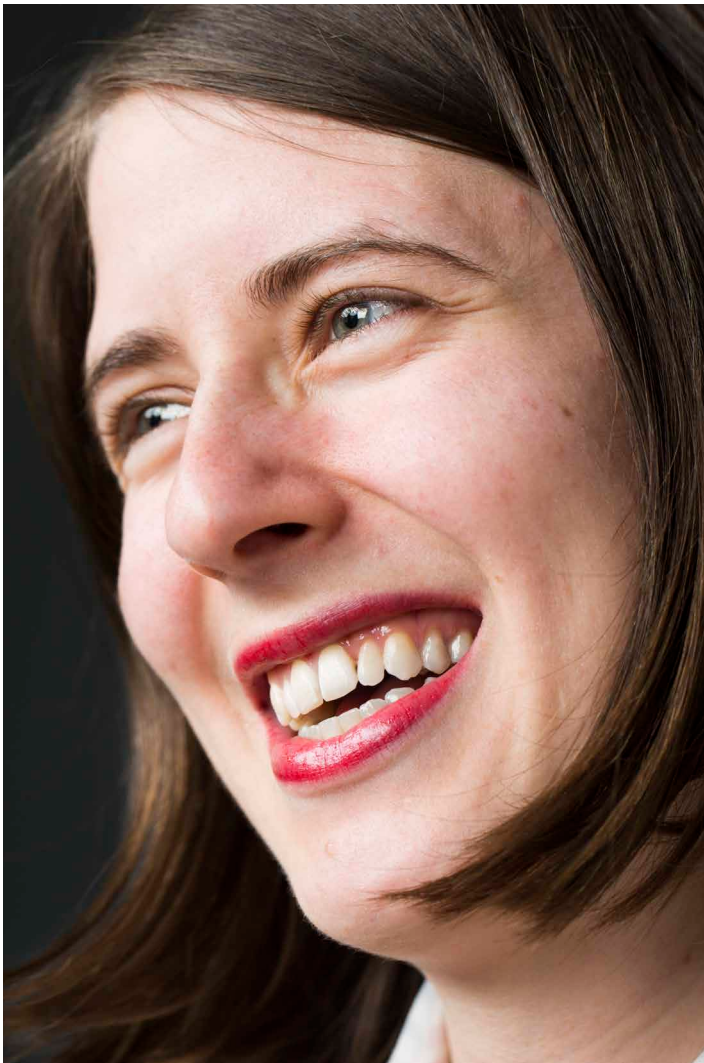
I felt at peace," she says of the experience, after she made the decision to put Syncadian on hold.

Janossy then joined global software firm Palantir at their London, UK office, where she's now helping governments and corporations to make sense of their complex data. At Palantir she's applying two skills she honed as an entrepreneur—iterate fast and constantly test hypotheses.

Janossy also credits her studies at U of T for laying foundations of her success. "A lot of what I studied in Industrial Engineering has proven to be really useful at Palantir. From human-computer interaction, to programming, to operations research, I have used every course's content at some point," she says.

Janossy is moving back to Canada in spring 2017 to be reunited with her husband who lives in Toronto, and will be working on Palantir projects from a Canadian home base.

*Her advice to aspiring entrepreneurs:
Invest in family. They make life worth living.*





"It's the most emotionally intense experience of my life. It can be so glamorous, and at the same time so lonely."

Khalil Zahar (MechE MASc IT4) never thought boxing, a hobby he took up as a student, would transform his life. That's precisely what happened when he founded Hykso in 2013.

Zahar wanted better feedback from his coaches, so he invented a device that slips into a boxer's hand wraps to measure punch count, speed and intensity, using gyroscopes and accelerometers. By recording more than 6,000 data points for every punch, Hykso trackers enable feedback to an unprecedented degree of precision.

The company, now based in Orange County, California makes enviable sales and has received funding from investors. But Zahar admits that life as an entrepreneur isn't all roses,

"It's the most emotionally intense experience of my life. It can be so glamorous, and at the same time so lonely.

The lifestyle can be pretty damaging to your health if you don't manage your habits properly, whether it's stress, food or exercise," he says.

2016 was a huge year for the company: the Canadian and American Olympic boxing teams trained using Hykso trackers leading up to the Summer Olympics in Rio.

Sport has taken notice.

Zahar believes that Hykso will have an impact not just on athletes and coaches, but also TV Networks, promoters, scouts, and others in the global sports industry.

"Our dream is to produce a paradigm shift in sports science, where athletes completely transcend the levels of performance currently known," he says. ●

*His advice to aspiring entrepreneurs:
There's a whole startup ecosystem around you that can help you succeed. Leverage them.*

FACTS & FIGURES



50+
Specialized Labs



70+
Invention Disclosures
in the Last Five Years

50+
Student Clubs Financially
Supported by MIE

65+
MIE Capstone Projects



504
Undergraduate and Graduate
Degrees Awarded (2014–2015)

487
Industrial Engineering
Undergraduates (Fall 2016)



38
UT-IMDI Industry
Partners

12 000
Active/Living Alumni

871

Mechanical Engineering
Undergraduates (Fall 2016)

160+

Industrial Partners

14 000 000

Total Research Funding

9

Canada Research
Chairs

1 358

Undergraduates (Fall 2016)



59

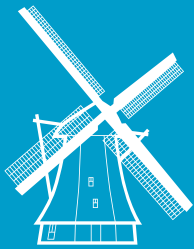
Faculty Members

620

Graduate Students
(Fall 2016)

MIE RESEARCH AT A GLANCE

The Department of Mechanical & Industrial Engineering is home to some of the most innovative thinkers in the world. As our faculty, graduate and undergraduate students continue to strive for research excellence, here is a glimpse into some of the cutting-edge, headline-making research stories from the past year.

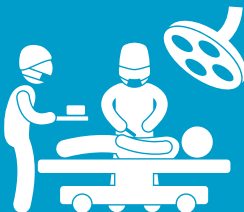


DESIGNING WINDMILLS FOR NICARAGUA

A group of MIE students have partnered with residents of Pedro Arauz, Nicaragua to design and construct a water-pumping windmill, providing critical irrigation during the area's long dry season.

The project is led by Professor **Amy Bilton** and was part of MIE 491: Capstone Design. Over the last few years, three different teams of undergraduates have worked closely with members of the community as well as the Winds of Change initiative to design the windmill.

When Bilton proposed the project in her fourth-year capstone design course, she was inundated with applications from students who wanted to participate. "It was definitely the project with the most social relevance, which I think is why so many teams were interested," says **Kshitij Gupta** (MechE 1T5), one of the first team members to work on the project.



OPTIMIZING SURGICAL SCHEDULES

Long wait lists for elective surgeries are a major challenge in the Canadian health care system. According to Professor **Dionne Aleman**, the problem may not necessarily be a lack of resources, but a result of inefficient use of resources.

"Hospitals have rules that indicate who gets operated on and when, but the schedules that result are sub-optimal," she said. Aleman and her team are addressing this problem by building mathematical models that can optimize the matches between patients, surgeons and operating rooms to generate the most efficient schedule.

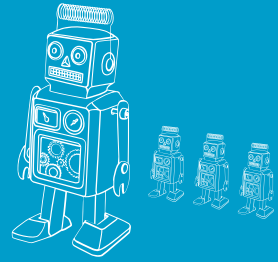
One technique the team uses involves pooling resources. Rather than each hospital maintaining its own waiting list, patients would be treated as a single large waiting list. Patients would be assigned to a given surgeon or operating room to minimize the time when resources are unused. Using optimization tools, the team has generated schedules that could increase the number of patients treated in a given time period by up to 30 per cent.

“SWARMING INTELLIGENCE” ROBOTS

In the basement of U of T’s Mining Building, **Justin Kim** (MechE PhD candidate), under the supervision of Professor **Beno Benhabib** and **Goldie Nejat**, is building tiny “swarm intelligence” robots that could one day have many potential applications, including assisting earthquake rescue operations.

“Most of the time human rescuers can’t get through the rubble,” he says. “The robots could be equipped with cameras and a light source that would wirelessly provide video to human supervisors monitoring the swarm.”

In space, such robots could be used to explore other planets or asteroids. Shrunk small enough, “micro-robots” deployed inside the human body à la *Fantastic Voyage* could be used to attack cancerous tumours, or clean plaque from blood vessel walls.



DRONE-DELIVERED AEDS



When a person goes into cardiac arrest, every passing minute hurts their chances of survival. Now, a group of U of T Engineering researchers want to use drones to deliver life-saving automatic external defibrillators (AEDs) rapidly and directly to homes.

Justin Boutilier (IndE PhD candidate) envisions a future in which a bystander or family member who witnesses a cardiac arrest can call 911, and within minutes, an AED is flown to their doorstep or balcony to be administered, even before the paramedics arrive.

Boutilier is working under Professor **Timothy Chan**, Director of the Centre for Healthcare Engineering at U of T, in collaboration with Professor **Angela Schoellig** (UTIAS) and researchers from the St. Michael’s Hospital Rescu program, in order to turn this futuristic idea into a life-saving reality.

UNRAVELING THE URBAN TANGLE

What makes a city tick? Why does it grow the way it does? How is it like other cities and yet unique?

With its forward-pushing Urban Genome Project, the University of Toronto is charting a better way forward for cities in the future.

Led by **Mark Fox**, U of T’s distinguished professor of urban systems engineering, and researchers from diverse fields of management, geography, sociology, and architecture, the Urban Genome Project is one of three recipients of the Connaught Global Challenge Award.

Like the Human Genome Project, which sequenced and mapped the complete human genetic blueprint to help solve thousands of diseases, Fox and Dan Silver, an associate sociology professor at U of T Scarborough, hope to pinpoint urban challenges and develop specialized solutions, akin to “a performance enhancing drug” for cities.



Read more MIE research news by
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NETWORK

LEARN

MENTOR

CONNECT

CONNECT is your new robust online alumni community – a gateway to enriching your professional and personal network. By joining you will also enhance the experiences of current senior students and UofT Engineering alumni.

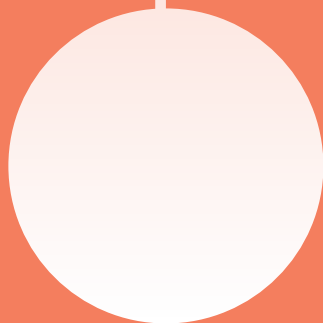
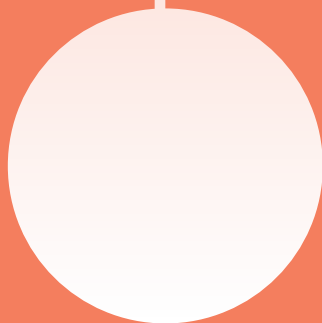
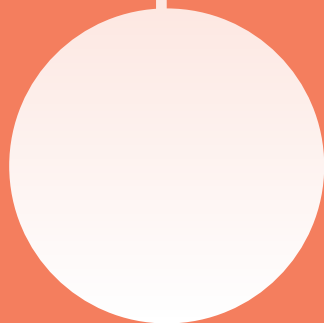
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