

SCHULICH SCHOOL OF ENGINEERING

Energizing Engineering Leadership

**STRATEGIC PLAN
PROGRESS REPORT 2015 - 2017**



SCHULICH
School of Engineering

In the fall of 2015, the University of Calgary's Schulich School of Engineering launched its strategic vision *Energizing Engineering Leadership*. Under the direction of Dean Bill Rosehart, the school focused its efforts on supporting student success, fostering diversity and research that makes a difference. This progress report outlines our achievements during the first half of our five-year strategic plan.

Values

As a community defined by energy, enterprise and excellence, we are changing lives through the shared values of our school: collaboration, creativity, kindness.

COLLABORATION

2017

Safer chuckwagon races

With the help of engineering, veterinary medicine and kinesiology researchers, biomedical engineering undergraduate student Sam Pollock is designing a better chuck wagon to improve safety for drivers and horses.



CREATIVITY

2017

Cirque du Soleil

School support made it possible for mechanical engineering undergraduate student Jason Chen-Leung to showcase his martial arts training on an international stage in Cirque du Soleil's production of KA.



Photo courtesy of Cirque du Soleil

KINDNESS

2017

Children's Birthday Miracles

Chemical engineering undergraduate student Sheliza Kassam won a Terry Fox Humanitarian Award for founding the Children's Birthday Miracles charity — giving thousands of kids from challenging circumstances the joy of a birthday party.



DEAN'S MESSAGE

Over the two years since the launch of our strategic vision *Energizing Engineering Leadership*, the Schulich School of Engineering has undergone a transformation. Our physical space has been reshaped into a modern facility — including new research and teaching spaces. Our students are developing as young professionals through our new Engineering Leadership Program. Our faculty has won more and bigger research grants along with national and international awards. Our alumni, nearly 1,000 of them, have supported *Energize: The Campaign for Eyes High* to enhance our school.

We launched exciting new programs — including a combined degree with the Haskayne School of Business that enables students to earn an engineering and business degree simultaneously. We graduated our first class of the now-accredited Energy Engineering program. We have new and expanded diversity initiatives, including marching in the Calgary Pride Parade, to show our commitment to inclusion. And, we have built an outstanding leadership team of individuals seeking new and innovative ways to meet our goals.

We have already achieved so much, but have only just begun. In the coming years, we will launch new programs to support entrepreneurial leadership. We will open new maker spaces to help our community build its ideas. And, we are searching for a new research chair in integrating indigenous knowledge into sustainable engineering.

With the commitment of our school, and the enthusiasm that has been shown these past two years, we know we will achieve our *Energizing Engineering Leadership* goals — together.

Bill Rosehart, P.Eng., PhD
Dean of the Schulich School of Engineering



SCHULICH SCHOOL OF ENGINEERING

Leadership Team

DEAN

Bill Rosehart, P.Eng.

SENIOR ASSOCIATE DEANS

Academic and Planning
Anders Nygren, P.Eng.

Research

Jocelyn Hayley, P.Eng.

ASSOCIATE DEANS

Graduate Studies
Gopal Achari, P.Eng.

Student Affairs and International

Anis Haque, P.Eng.

Student Professional Development

Arin Sen, P.Eng.

Diversity and Equity
Teaching and Learning
Qiao Sun, P.Eng.

DEPARTMENT HEADS

Chemical and Petroleum
Ayodeji Aderopo Jeje, P.Eng.

Civil

Ron Chik-Kwong Wong, P.Eng.

Electrical and Computer

David Westwick, P.Eng.

Geomatics

Derek Lichti, P.Eng.

Mechanical and Manufacturing

Robert Brennan, P.Eng.

DIRECTOR, BUSINESS OPERATIONS

Bethe Andreasen



Look for this symbol throughout our progress report highlighting some of our exceptional accomplishments.

Building Our New Home

By transforming six separate buildings into a cohesive teaching and research facility, the Canadian Natural Resources Limited Engineering Complex is energizing engineering leadership today and for generations to come. A community of 6,615 people donated to make our new home a reality. With 18,300 square metres of new space and 11,100 square metres of renovations, we are able to support innovative approaches to teaching, research and co-curricular activities.



Building on our history

Our new building, which won the 2017 Engineering Award at the Alberta Steel Design Awards of Excellence, honours 50 years of engineering education by incorporating aspects of the original architecture into the new complex.

Hands-on learning and maker spaces

We support learning through state-of-the-art design labs, new spaces for clubs and teams, dedicated study rooms and a social staircase where students can work, relax or celebrate.

Fostering collaboration

We created collision spaces for students, faculty and staff to gather, brainstorm and interact in ways we have never seen before.

Inspiring innovation

Two new floors of high-tech research labs are the ideal home for innovative minds to challenge the boundaries of research understanding.

Community of caring

Support from the Government of Alberta, Government of Canada, Canadian Natural Resources Limited, Seymour Schulich and thousands of others made this \$174-million complex possible!



Expanding our efforts

Thanks to the success of our new engineering complex in enhancing teaching, learning and research, we have accelerated construction for other significant engineering infrastructure projects including:

- Modernizing the Mechanical Engineering building
- Renovating research labs in the Information and Communications Technologies building (ICT)
- Upgrading spaces in the engineering complex D block

Proceeding with these important infrastructure projects has meant pulling together and sharing space like never before. For instance, under the guidance of the Mechanical Engineering leadership team, we relocated a complete building of students, faculty and staff in weeks to allow renovations to begin.



Committed to Student Success

From their first class to graduation day, and throughout their careers, students' success is nurtured by the Schulich School of Engineering. Supporting student success is one of our three foundational pillars. By providing enhanced student support, teaching and learning excellence, and real-world experiences, we are ensuring our students have rich learning opportunities inside and outside the classroom.

675

engineering undergraduate
degrees earned in 2016-2017,
22% more than two years ago

\$500K

allocated annually to
support co-curricular
student activities, field
trips, clubs and teams

15%

increase in student work
placements with 417 students
on internship in 2017

Ongoing

From internship to exchange programs

Our international programs give students a global education. Engineering Students' Society President Laura Fader (chemical and petroleum) visited 35 different countries during her undergrad. She volunteered in Costa Rica, built homes in Mexico, competed at MIT and spent a year working as an intern in Switzerland.

OVER
95%

of our students are continuing in engineering after their first year – our highest-ever retention rate

500

more student spaces, completing a 4-year plan to increase access to engineering

21

new faculty hired

GOAL: **STUDENT SUPPORT**



2015 – present

Energy Engineering program

We celebrated the first graduating class of the Energy Engineering program which allows students with approved technical diplomas to earn an engineering degree with two additional years at the University of Calgary. Thanks to the hard work of a team led by associate dean Anders Nygren (electrical and computer) and Bob Brennan (mechanical and manufacturing), this exciting new pathway allows students to expand on their previous studies to earn an accredited engineering degree.

Record retention rates ✓

First-year engineering is traditionally the most difficult time for students academically. Additional student support, tutoring and advising undertaken by the staff of the Engineering Student Centre, as well as teaching excellence from our dedicated faculty members, have resulted in our highest-ever retention rates. With 95.6 per cent of our students continuing in engineering after their first year, we are up nearly 11 per cent since 2013.

2016 – 2017

Biggest first-year classes ever ✓

Thanks to the opening of the Canadian Natural Resources Limited Engineering Complex, we welcomed our largest-ever first-year classes in 2016 and 2017. We now enroll over 800 new undergraduate students each year.

2017

Associate Dean of Graduate Studies

To enhance the student experience and support for 1,100 students pursuing graduate studies, we established a new associate dean of graduate studies. This position is currently held by Gopal Achari who is also director of the Centre for Environmental Engineering Research and Education.

Combining student and career services

Co-locating our Engineering Student Centre and Engineering Career Centre, we created a one-stop shop for students requiring academic and career support. This makes it easier for students to access the assistance they need to succeed.

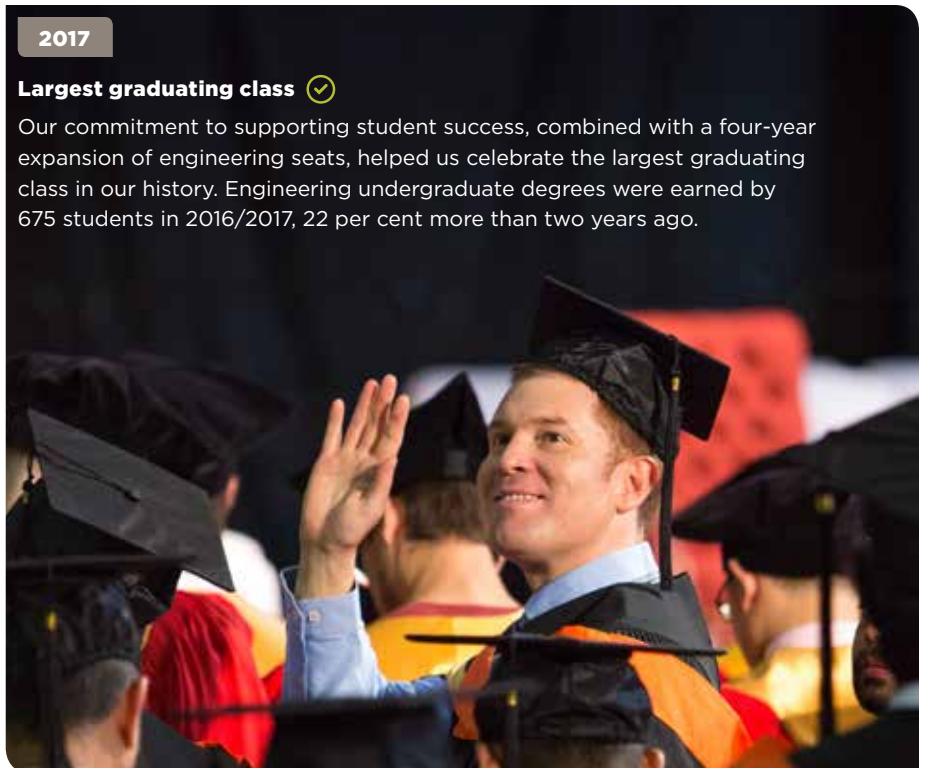
Our first Rhodes Scholar ✓

Mechanical engineering graduate James Thorogood, BSc(Eng)'17, became our first-ever engineering Rhodes Scholar thanks to his efforts with Engineers Without Borders in Ghana. He helped identify rural business opportunities — reducing local dependence on imported goods.

2017

Largest graduating class ✓

Our commitment to supporting student success, combined with a four-year expansion of engineering seats, helped us celebrate the largest graduating class in our history. Engineering undergraduate degrees were earned by 675 students in 2016/2017, 22 per cent more than two years ago.



2017

Olympics to grad studies ✓

After competing in two Olympic Games, cyclist and mechanical engineering graduate Monique Sullivan, BSc(Eng)'15, began working with us, encouraging young women to pursue careers in science, technology, engineering and math (STEM). Ultimately, this inspired her to become a graduate student at Schulich, investigating new approaches to engineering education.



GOAL: TEACHING AND LEARNING EXCELLENCE

2015

International engineering education award ✓

Chandana Wirasinghe (civil) is the first Sri Lankan and first Canadian to earn the World Federation of Engineering Organizations' Medal of Excellence in Engineering Education.

2015 – 2017

Student lab equipment

We invested \$1.3 million in undergraduate lab equipment upgrades, improving the student experience.

2015 – present

Killam Awards ✓

The Killam Annual Professors Awards honour leaders in teaching, mentorship, research and service. Engineering winners include:

- Josephine Hill (chemical and petroleum)
- Michael Kallos (biomedical)
- Raafat El-Hacha (civil)

Steve Liang (geomatics) received the Killam Emerging Research Leader Award.

Laleh Behjat (electrical and computer) received the Graduate Supervision and Mentorship Award.

Ron Hugo (mechanical and manufacturing) received the McCaig-Killam Teaching Award.

2017

New design chair

Bob Brennan (mechanical and manufacturing) and Simon Li (mechanical and manufacturing) were awarded a Natural Sciences and Engineering Research Council of Canada Chair in Design Engineering, with support from Spartan Controls and Suncor Foundation, to help us broaden our hands-on learning experiences throughout the engineering curriculum.



2015 – present

Killam graduate scholarships ✓

Graduate students earned scholarships for their abilities to advance learning and to win distinction in their profession.

- Adedapo Awolayo (chemical and petroleum)
- Sagar Kumar Dhar (electrical and computer)
- Rania Sayed Eid (civil)
- Peng He (chemical and petroleum)
- Annamaris Olmo-Velazquez (mechanical and manufacturing)
- Scott Sibole (biomedical)
- Jessica Kupper (mechanical and manufacturing)
- Muhammad Omer (electrical and computer)
- Tushar Sharma (electrical and computer)
- Krysta Powers (biomedical)
- Kelsey Collins (biomedical)

- Amin Farshidi (electrical and computer)
- Fatemeh Hendijani Fard (electrical and computer)

Postdoctoral Laureates

- Daniel Oloumi (electrical and computer)
- Tanaji More (civil)

Problem-based learning

Our school continues to embrace hands-on learning for our students – incorporating a design challenge into our first-year orientation activities, growing our final-year capstone design course, and supporting interactive clubs and teams.

New faculty hired

To continue enhancing teaching and learning, 12 new assistant professors, eight instructors and one senior instructor have been hired since 2015.

GOAL: REAL-WORLD STUDENT EXPERIENCE

2015 - present

New international experiences

To enhance international education opportunities, we launched “Spain Through the Eyes of an Engineer” — a summer study-abroad program where students spend five weeks in Málaga, Spain. This is one of several engineering-specific study-abroad programs we offer to support international learning experiences.

Homes of Hope

Our students went to Mexico to build eight homes for families in need. This meaningful, international volunteer opportunity is made possible by a five-year partnership with Boardwalk Rental Communities’ Changing Lives Benefit.



Supporting student experiences

We continue to provide \$500,000 annually through the Schulich Student Activities Fund to ensure our students can travel to international competitions, hold team and club events, go on field trips, attend conferences and more.

2016 - present

New lecture series

With the generous support of Alka and Sanjeev Khanna, the Engineering Career Centre launched a new lecture series exploring engineering leadership. Featured speakers include entrepreneur W. Brett Wilson and astronaut Robert Thirsk, BSc(Eng)'76, who shared how an engineering education shaped their careers.



2016 - present

New Engineering Leadership program

As part of our focus on developing engineering leaders, associate dean Arin Sen (chemical and petroleum) launched a new leadership program. Students receive professional development in time management, networking, teamwork, presentation skills, conflict resolution and strategic planning.

Expanded internship options

To promote student career development, Jenny Cruickshank (Engineering Career Centre) and her team worked with new employers to initiate more flexible four to 16-month internship options. This allows some students to combine back-to-back experiences with multiple organizations to meet our year-long requirement for paid work placements.

2017

Record number of work placements ✓

By fostering new connections between students and future employers, we were able to successfully place a record 417 students on internships, with overall placements up 15 per cent.



Rachel Ho, intern

We are dedicated to preparing our graduates for the workforce through meaningful work experiences. Rachel Ho worked in pipeline abandonment during her internship, surveying well sites by helicopter to document equipment inventory and access routes.



Fostering Diversity

At its core, engineering is a call to serve humanity. For this creative field to thrive, we need to cultivate an environment where people with a variety of backgrounds, genders, interests and talents feel welcome and included. Fostering diversity is the second of our foundational pillars. By promoting inclusion, health and wellness, we are striving to make everyone feel at home.

OVER
5K

cans donated to local food banks to promote health and wellness through food equity

69

engineering students attended the Grace Hopper Celebration since 2015 – the world's largest gathering of women in tech

25

student facilitators promote engineering as an exciting career path through community outreach



OVER
75

students, faculty and staff
marched in the Calgary Pride
Parade to celebrate inclusion

248

Cybermentor relationships
between female mentors
in STEM and young students

OVER
100

classrooms and thousands
of students have been reached
by our Discover Engineering
at Schulich team

GOAL: INCLUDING ALL

2015 – present

Discover Engineering at Schulich

To promote engineering as an exciting career path, we launched a new initiative in which 25 trained student facilitators, primarily from under-represented groups themselves, lead engineering career workshops for grades 11 and 12 students. Well over 100 classrooms and thousands of students have been reached thus far.



2015 – present

Calgary Pride Parade

To demonstrate our commitment to inclusivity, we proudly participate in the Calgary Pride Parade. With support from associate dean Qiao Sun (mechanical), Emily Wyatt and Hailee Turpin (recruitment and outreach), our Schulich participation has more than tripled in size since we first marched in 2015.

Go ENG Girl

Sparking interest in STEM for girls in grades 7 to 10, this program provides hands-on activities, exhibits and talks targeting students and their parents. Originally launched in Ontario, Go ENG Girl is a new Schulich outreach activity.

Grace Hopper Celebration

Since fall of 2015, we have sent 69 female students to the Grace Hopper Celebration, the world's largest gathering of women in technology.

Outreach activities

Through our support of Minds in Motion summer camps, Women in Engineering Day, Explore IT, Cybermentor and Go ENG Girl, we continue to provide experiential learning opportunities for youth in STEM – reaching thousands of young people each year.

2016 – present

Association for the Advancement of Science and Engineering Education (AASEE)

Associate dean Anis Haque (electrical and computer) has a passion for inspiring engineers in rural areas. He formed AASEE and tours elementary classrooms in regions such as Grande Prairie and the Northwest Territories to spark interest in STEM.

2016

Diversity in the workplace award

Schulich was honoured with the KNOVO Award of Distinction for diversity initiatives promoting change within the engineering profession. KNOVO is an initiative of the Calgary Council For Advanced Technology with funding provided by Status of Women Canada. It is focused on increasing women's recruitment, retention and advancement in technology.

2017

Google Ignite

Laleh Behjat (electrical and computer) and Mohammad Moshirpour (electrical and computer) partnered with Google Canada to promote coding to youth through events for high school students.

International diversity award finalist

The Discover Engineering at Schulich team, founded in 2015 by Milana Trifkovic (chemical and petroleum), was one of three global finalists for the 2017 GEDC Airbus Diversity Award.

Women in Data Science

We were the only Canadian university to host a satellite site for the Women in Data Science Conference which involved 80 cities from 30 countries. Led by Stanford University and featuring women speakers in data science, it offered our graduate students, faculty and industry leaders an opportunity to connect and exchange ideas.



Cybermentor Thundercloud Parade
Beakerhead 2016

Photo by Trevor Lalondea

International outreach award

An innovative online mentorship program, launched by University of Calgary President Elizabeth Cannon, has become the first Canadian university program to win the Women in Engineering Initiative Award (WEPAN). Cybermentor builds relationships between female mentors in STEM careers and young students.

Power to Choose

We help provide Indigenous youth with a positive engineering experience through our partnership with the Alberta Women's Science Network on the Power to Choose Aboriginal Youth Summer STEM Camp. This free science camp is open to high school students within Treaty 7 territory.

Ongoing

Institute of Electrical and Electronics Engineers Young Professionals Group (IEEE)

Under the leadership of electrical and computer graduate student Tushar Sharma, IEEE is building radio astronomy equipment on the Siksika First Nation. The project helps promote scientific research in Indigenous communities while honouring thousands of years of Blackfoot heritage and culture.

Unconscious bias training

To promote greater diversity within our school, unconscious bias awareness sessions have become part of the process for faculty hiring committees.

Advancing our hiring practices

We have incorporated research-based best practices to create more effective job postings and advertisements to attract a diverse pool of qualified candidates.



2017

Rings of Reconciliation

At Beakerhead, this illuminated dream catcher glows behind Reg Crowshoe — a member of the University of Calgary Senate and Blackfoot cultural and spiritual leader. It was the vision of two members of the Métis community including one from the Werklund School of Education, and brought to life with support from Schulich.

GOAL: PROMOTING HEALTH AND WELLNESS

2015 - 2017

Schulich Stampede Breakfast

Students, faculty, staff, alumni and guests enjoyed fresh pancakes hot off the grill at our Stampede Breakfast. The Calgary Stampede Caravan Committee prepared about 400 breakfasts each year and showcased traditional western hospitality.



2016

Construction for a cause

Using more than 5,000 cans, staff from all of our departments came together for National Philanthropy Day. They designed and built sculptures including a globe, a giant shoe and the Calgary Tower. The non-perishable food items were later donated to local food banks.



2017

Expanding graduate student opportunities

By making our Petroleum Engineering and Energy and Environment MEng programs cohort-based — where our students move through the program as a single class — we have expanded the number of seats in these professional graduate programs. This also allows us to welcome more students from partner international universities through our 3+2 programs.

Recognizing leadership from within

Under the direction of director of business operations Bethe Andreassen, we created new awards to acknowledge our staff members who champion diversity, enhance research impact and support student success. In addition, we established outstanding teaching performance and research excellence awards for our faculty. We also launched new engineering alumni awards to highlight graduates whose achievements inspire others.

2017

Schulich Safety and Wellness Week

As we continue building a healthy and safe campus, we launched a faculty-wide safety week. With guidance from our safety partner Matt Robertson, faculty and staff collaborated to review and upgrade all key safety documents. Events were also held to promote safety and personal wellness.



Ongoing

Anti-violence advocacy

To honour the National Day of Remembrance and Action on Violence Against Women, associate dean Qiao Sun (mechanical and manufacturing) shared the importance of safety and security for everyone alongside the honourable Stephanie McLean, Minister of the Status of Women.

Building community

We created new social spaces to promote collaboration and build camaraderie for students, faculty and staff. We also expanded internal communications, including weekly dean's messages and new staff forums to focus on our strategic goals.

English support for international graduate students

We implemented the first International Foundations Program Pathway for graduate students. In partnership with the Werklund School of Education, English language training for engineering concepts is provided to help remove language barriers. This model expands on similar support already offered to undergraduate students.

Supporting international students

Moving to a new country can be a dramatic change. We are implementing new strategies to help our international students feel at home. These include social gatherings to help foster personal connections, student ambassadors to help international students get settled and increased communications.



2017

Improving working conditions

We launched an administrative task force and a technical task force, led by our staff leaders, to promote ways we can energize our activities to support students, diversity and research excellence.

Ongoing

Mental health strategy

We support the University of Calgary's Campus Mental Health Strategy which was developed under the leadership of Provost and Vice-President (Academic) Dru Marshall. Currently, we are applying a mental health lens to the creation of new academic programs and to evaluate faculty and staff workloads.



Research That Makes A Difference

We are committed to promoting research that has a real, measurable and lasting impact on people's lives. Research that makes a difference is our third foundational pillar. By supporting leading researchers, increasing collaborations and focusing on innovation, we are demonstrating the best of what engineers can be.



Our achievements support President Elizabeth Cannon and the University of Calgary's *Eyes High* goal to be recognized as one of Canada's top five research universities, fully engaging the communities we both serve and lead.

5

national research
chairs announced

61

new research partnerships
initiated by engineering
faculty members

97

Natural Sciences and Engineering
Research Council of Canada
partnership grants awarded including
Engage, CRD and SPG grants



Kristina Rinker

\$75M

awarded to the University of Calgary to find innovative, low-carbon fossil-fuel-based energy systems

23%

increase in funding from the Natural Sciences and Engineering Research Council of Canada to \$9.55 million in 2016-2017

\$4.1M

in research equipment grants awarded since 2015

GOAL: LEADING RESEARCH

2015 - present

Enhanced support for researchers

Under the leadership of associate dean Jocelyn Hayley (civil) we now offer a full range of support services to enhance success rates for researchers seeking funding. These include individualized strategy sessions to help academics refine their research goals, identify possible collaborators and find strategic funding opportunities. We also support best practices in grant applications, building an academic's brand online and building relationships with outside partners.



Jocelyn Hayley

Increased research funding

With enhanced support and new processes, we've seen a 23 per cent increase in NSERC funding for our engineering researchers — up from \$7.73 million in 2014-2015 to \$9.55 million in 2016-2017.

2015 - 2017

APEGA Summit and ASTech Awards

David Wood (mechanical and manufacturing) received the 2015 Environment and Sustainability Award for applying engineering methods to environmental preservation and sustainable development.



Josephine Hill (chemical and petroleum) received the 2017 Research Excellence Award for leading-edge research on alternative energy and sustainable fuel generation.

Associate dean Jocelyn Hayley (civil) received the 2017 Women in Engineering and Geoscience Champion Award for her passionate support of women in engineering.

Laleh Behjat (electrical and computer) received the 2015 Women in Engineering and Geoscience Champion Award for her advocacy encouraging women to enter engineering.

Ian Gates (chemical and petroleum) received the 2016 ASTech Award for Innovation in Oil Sands Research for his work in heavy oil recovery process design.

The Schulich Engineering Outreach team received the 2017 ASTech Award for Excellence in Science and Technology Public Awareness. The team includes Milana Trifkovic (chemical and petroleum), Laleh Behjat (electrical and computer), Mohammad Moshirpour (electrical and computer) and electrical and computer graduate students Emily Marasco and Stephanie Hladik.

2016 - present

Canada Research Chairs

Joule Bergerson (chemical and petroleum) was named the Canada Research Chair in Energy Technology Assessment in 2017 for her work using data to help the industry meet global climate-change concerns. She was also named to the Royal Society of Canada's College of New Scholars, Artists and Scientists.

In 2016, Naser El-Sheimy (geomatics) was named Tier I Canada Research Chair in Geomatics Multi-Sensor Systems and Seonghwan (Sam) Kim (mechanical and manufacturing) was named Tier II Canada Research Chair in Nano Sensing Systems.

Industrial Research Chairs

Brij Maini's (chemical and petroleum) work investigating how the heavy-oil industry can compete with conventional extraction earned him the NSERC/Nexen and CNOOC Industrial Research Chair in Advanced In-situ Recovery Processes for Oil Sands in 2017. Maini follows eight engineering researchers celebrated in 2016 for their industrial research chairs in a host of energy and environment-related research fields.

Investment in lab equipment

Thanks to research grants, donations and internal funding, we were able to invest \$4.1 million to purchase new equipment that supports core research initiatives.

Prestigious fellowships

Nigel Shrive (civil) and Rangaraj M. Rangayyan (electrical and computer) were named fellows of the Royal Society of Canada.

Dean Bill Rosehart (electrical and computer), Zhangxing (John) Chen (chemical and petroleum) and Tom Brown (civil) were named fellows of the Canadian Academy of Engineering.

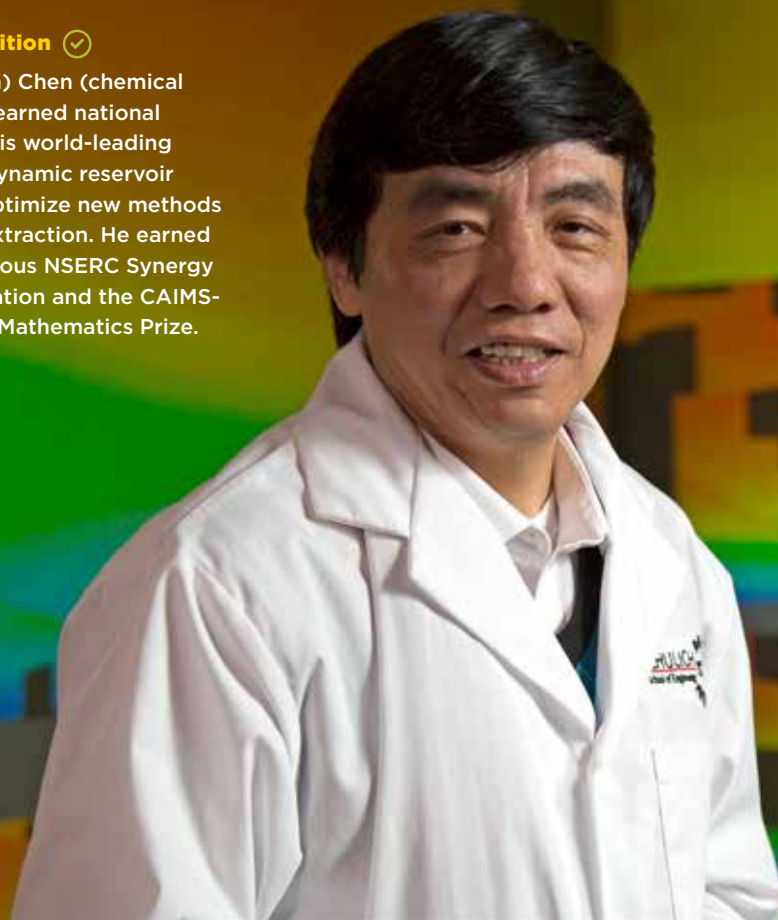
Associate dean Jocelyn Hayley (civil) and Lynne Cowe Falls (civil) were named fellows of the Engineering Institute of Canada.

Associate dean Gopal Archari (environmental) was named as a fellow of the Canadian Society of Civil Engineering.

2017

National recognition

Zhangxing (John) Chen (chemical and petroleum) earned national recognition for his world-leading research using dynamic reservoir simulations to optimize new methods for oil and gas extraction. He earned both the prestigious NSERC Synergy Award for Innovation and the CAIMS-Fields Industrial Mathematics Prize.



GOAL: **WORKING IN TEAMS**

2015 - present

Advancing Canadian Wastewater Assets (ACWA)

Researchers Joo Hwa (Andrew) Tay (civil) and associate dean Gopal Achari (environmental) are investigating new methods to treat wastewater as part of the University of Calgary's collaboration with the City of Calgary at the Pine Creak Wastewater Treatment Centre. ACWA is the first facility of its kind to bridge the gap between pilot-scale research laboratories and full-scale municipal wastewater treatment plants.

Strategic research partnerships ✓

Since 2015, the Schulich School of Engineering has been awarded five prestigious Strategic Partnership Grants. The grants are given to researchers who are partnering with industry or government organizations on projects that could strongly enhance Canada's economy, society or environment within the next decade.

2016 - present

\$75-million CFREF grant ✓

Under the leadership of Vice-President Research Ed McCauley, and working collaboratively with energy researchers across campus, the Schulich School of Engineering supported the University of Calgary's successful Canada First Research Excellence Fund (CFREF) proposal to establish a Global Research Initiative in Sustainable Low Carbon Unconventional Resources. Engineering researchers are among those working to find innovative, low-carbon fossil-fuel-based energy systems.

Sparking industry connections

As part of our commitment to team-based research, we established a new position to help facilitate new industry connections, and promote collaborative research projects and knowledge transfer. Terry Ross is our first entrepreneurship and research partnership specialist.

2017 - present

Autonomous vehicle navigation

Naser El-Sheimy (geomatics) is working on intelligent multi-sensor systems, wireless technologies and software for navigation in autonomous vehicles. The result will be low-cost, small, integrated vehicular navigation and guidance systems that are safer, more accurate and more robust.



Affordable, cleaner technologies

Ted Roberts, Milana Trifkovic and Kunal Karan (chemical and petroleum) are developing new, lower-cost materials to make cleaner technologies more affordable, enable rapid adoption of renewable energy and create new ways to clean water.

Digital records of heritage sites

Derek Lichti (geomatics) partnered with a University of Calgary archaeologist to use reality capture technology to create a 3D digital record of Alberta's endangered heritage sites. This method allows us to identify change or damage over time and to digitally preserve key landmarks for future generations.

Creating new teams ✓

Two engineering-led programs have received a combined total of \$3.3 million in funding over the next six years thanks to the NSERC Collaborative Research and Training Experience (CREATE) program.

2017 - present

Renewable energy possibilities

Andy Knight (electrical and computer) leads a team developing leading-edge solutions that will result in the sustainable development of the electrical system, storage of renewable energy and a dependable, consistent supply of electricity.



GOAL: IMPROVING LIVES

2015 - present

Improving road safety

Whether it is investigating the future of autonomous vehicles or tracking collisions after merging school and playground hours, Lina Kattan (civil) is making roads safer for everyone.



2015 - present

Security beyond fingerprints

The Biometric Technologies Lab, led by Svetlana Yanushkevich (electrical and computer), is developing new approaches to improve identity-management systems for airports, public events, hospitals and schools. These technologies minimize the risk of misidentification and improve security while respecting privacy.



2016

Preventing stroke

Associate dean Arin Sen (chemical and petroleum) and his team are working on stroke prevention methods by researching new biomedical engineering techniques to fix blood vessels in the brain before a stroke occurs.



2017 - present

Early cancer detection initiative

In collaboration with the Cumming School of Medicine, Kristina Rinker (biomedical) is launching a new early cancer detection initiative. It brings together University of Calgary researchers and clinicians to collaborate on transformative research projects that will detect a variety of cancers earlier and improve patient outcomes.

Ongoing

Future technology today

Led by Fadhel Ghannouchi (electrical and computer), researchers in our iRadio Lab are developing faster, interconnected and broadcast-quality technologies that will underpin the 5G cellular communications system. This next-generation standard of telecommunications is expected to be implemented by 2020 and is designed as a communications lifeline during natural disasters.

Sustainability Awards

Ed Nowicki (electrical and computer) and David Wood (mechanical and manufacturing) won the University of Calgary's 2016 Community as a Learning Partner Award for their project on Small Scale Hydro for Rural Health in Nepal.

Joule Bergerson (chemical and petroleum) won the 2016 Teaching Leadership Award for her research and advocacy of sustainable practices in her Life Cycle Assessment course.



Leading Entrepreneurs

In 2017, the University of Calgary announced the new Hunter Hub for Entrepreneurial Thinking — made possible by a \$40-million gift from the Hunter Family Foundation. At Schulich, our focus on leadership has always included entrepreneurial thinking. We launched a new, combined-degree program with the Haskayne School of Business. We partner with Innovate Calgary to bring student and research projects to market. And, we are building a series of new maker spaces. Join us as we expand our efforts to promote entrepreneurship and innovation in our community.

49

new invention disclosures filed with Innovate Calgary

\$12.7M

raised for engineering student experiences through *Energize: The Campaign for Eyes High*

OVER
\$6M

in support for students to pursue our new combined engineering and business degree

**Thinker
Creator
Designer
Innovator
Entrepreneur
Communicator
Team Player
Leader**

NEARLY
200

student inventions and
projects showcased at
Capstone Design Fairs

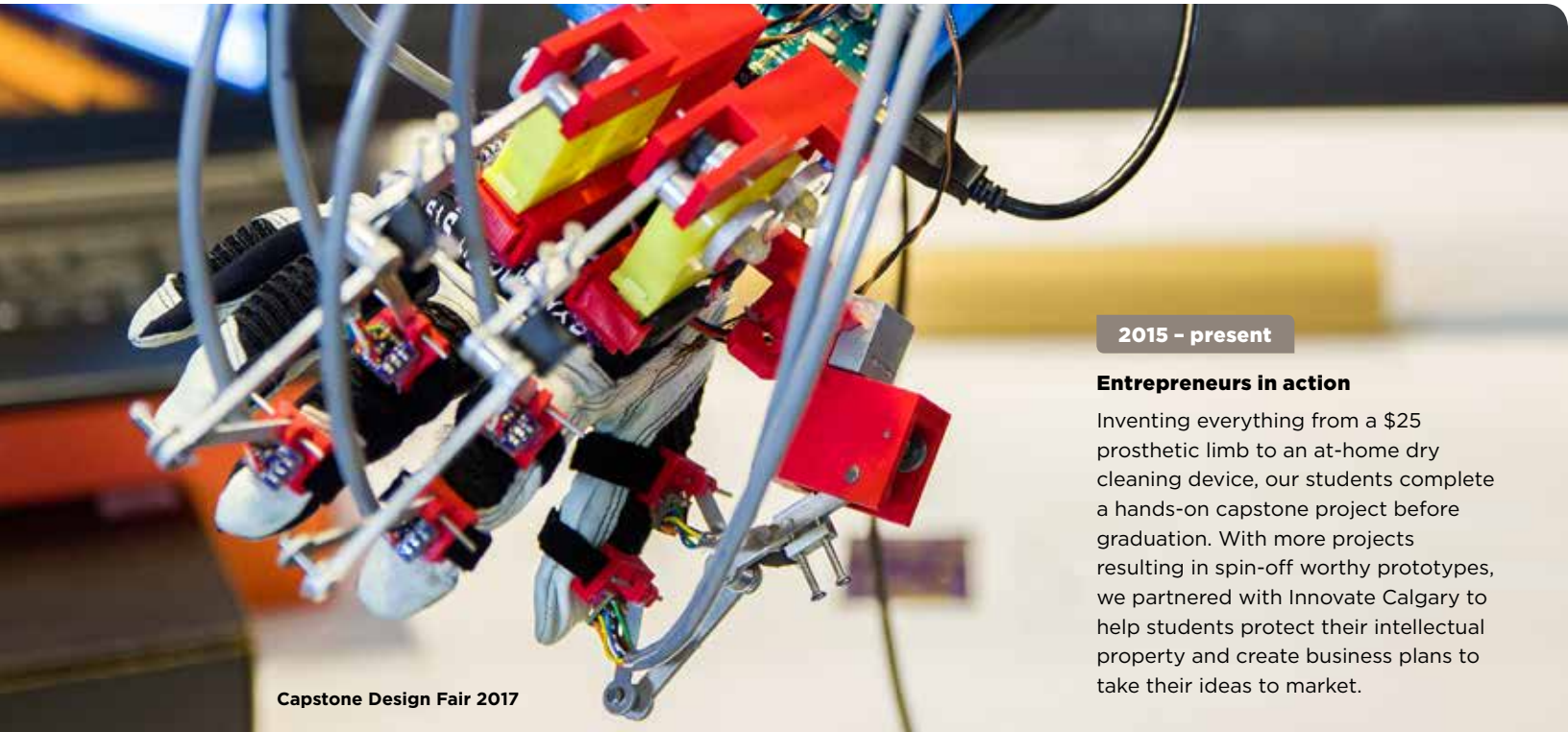
OVER
150

community innovators
engaged with engineering
through Rainforest Alberta

NEARLY
20%

of 2017 Creative Destruction Lab
Rockies applicants seeking to
develop successful companies are
engineering faculty or graduates

GOAL: **BUILDING STUDENT LEADERS**



Capstone Design Fair 2017

2015 – present

Entrepreneurs in action

Inventing everything from a \$25 prosthetic limb to an at-home dry cleaning device, our students complete a hands-on capstone project before graduation. With more projects resulting in spin-off worthy prototypes, we partnered with Innovate Calgary to help students protect their intellectual property and create business plans to take their ideas to market.

2016 – present

Engineering and business program

Students once torn between taking a bachelor's degree in engineering or business can now earn both in as little as five years thanks to a new program launched in collaboration with the Haskayne School of Business. The program is the only one of its kind in Western Canada.

New student scholarships ✓

Our new combined engineering and business program has garnered \$5 million in support from Clayton and Linda Woitas and family, and \$1 million in support from Jack and Louise Lee. Both families launched scholarships to help students pursue this exciting new opportunity.

2017

Digital buddy systems

Mechanical and biomedical engineering student Manpreet Deol is working with her sister to develop a not-for-profit organization that creates safe, accessible and user-friendly social networking applications for individuals with intellectual disabilities.

Ongoing

Fostering entrepreneurship

An engineer and inventor himself, Alex Bruton (geomatics) is on a mission to help people learn to innovate. He brings his enthusiasm and insight into a technical elective around entrepreneurship that brings out-of-the-box thinking into focus for our students.

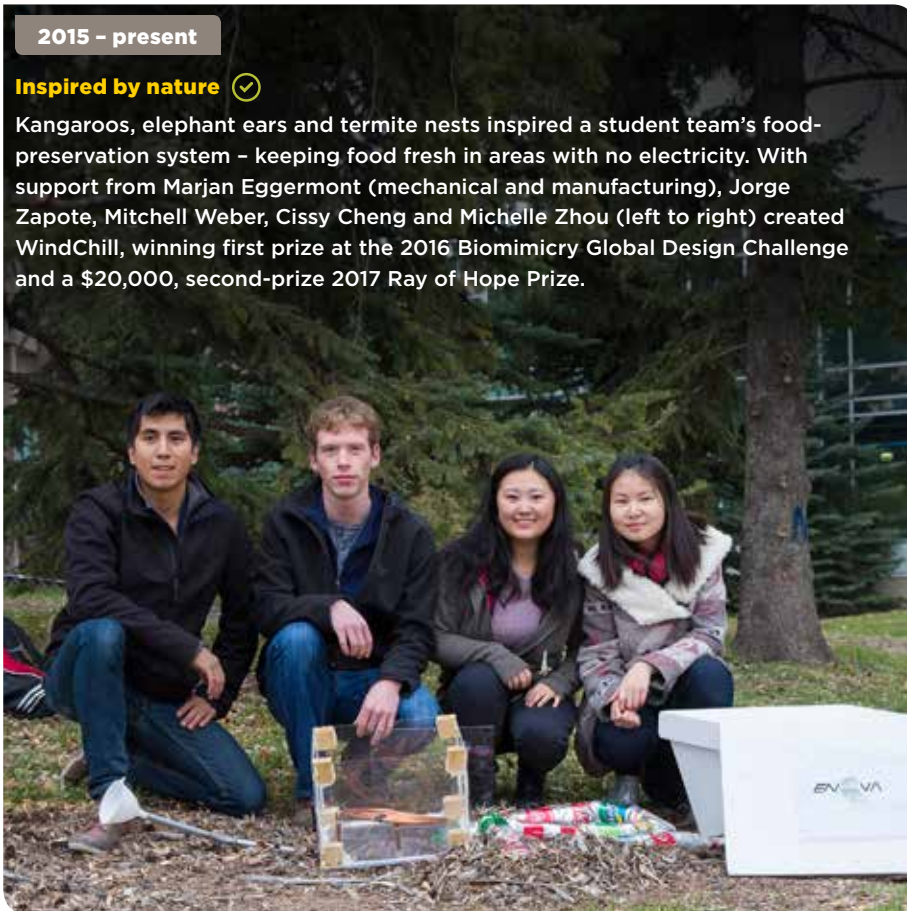


GOAL: DEVELOPING RESEARCH LEADERS

2015 - present

Inspired by nature ✓

Kangaroos, elephant ears and termite nests inspired a student team's food-preservation system - keeping food fresh in areas with no electricity. With support from Marjan Eggermont (mechanical and manufacturing), Jorge Zapote, Mitchell Weber, Cissy Cheng and Michelle Zhou (left to right) created WindChill, winning first prize at the 2016 Biomimicry Global Design Challenge and a \$20,000, second-prize 2017 Ray of Hope Prize.



2017

Accidental discovery

Ian Gates (chemical and petroleum) was trying to upgrade bitumen when he accidentally downgraded it instead, creating bitumen bubbles with a firm outer coating. This happy accident resulted in a safer, cleaner way to ship oil - an innovation that could revolutionize Canada's energy sector.

2016

Designing drones for good ✓

4Front Robotics, the spin-off company of Alex Ramirez-Serrano (mechanical and manufacturing), placed second at the 2016 UAE Drones for Good competition with its UAV search and rescue technology.

2016 - present

Ammolite BioModels ✓

Aubrey Blair-Pattinson's biomedical engineering master's thesis on bone simulation materials sparked Ammolite BioModels. With support from engineering leaders such as Carolyn Anglin (civil and biomedical), she now leads the company that creates realistic and cost-effective synthetic bones to improve medical training. The company won \$100,000 at the inaugural TENET I2C (Innovation to Commercialization) Competition to transition its product to market.



**Through a united vision and bold actions,
we are transforming engineering in Canada.
Join us as we expand our efforts to support
student success, find new ways to foster
diversity and develop leading research that
changes lives.**

Bill Rosehart, Dean, Schulich School of Engineering



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School of Engineering

Schulich School of Engineering
University of Calgary
2500 University Drive NW, Calgary, Alberta T2N 1N4
schulich.ucalgary.ca