DALHOUSIE UNIVERSITY
FACULTY OF ENGINEERING

THINKERS & DOERS

STRATEGIC PLAN 2015–2020

INTRODUCTION

This is an extremely exciting period in Dalhousie Engineering's history.

We are at an all time high in enrolment and research activity and we continue to evolve our programs to meet the needs of Canadian Industry.

This plan was developed by a large group of **"Thinkers and Doers"** including professors, staff, and students. It lays out some ambitious goals and provides some well thought out strategies to achieve them.

I would especially like to recognize the leadership of Dr. Rob Bauer our Assistant Dean of Planning for his hard work in putting this plan together. I look forward to his regular updates on progress towards our goals.

L. Joshua Leon Ph.D., P.Eng., FEC, FCAE
Dean, Faculty of Engineering

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Cover photo: (from left) Engineering Students Alyson Petsche, Jessica Li, Walter Jothiraj, Ral Bielawski, Krista Prosser

A MESSAGE FROM THE ASSISTANT DEAN OF PLANNING

I am very pleased to introduce the Faculty of Engineering Strategic Plan. It is the result of a six-month collaborative process that included wide consultation with staff, students, and faculty. The plan lays out our four primary goals:

- deliver outstanding education in engineering and applied science to our students
- perform excellent engineering research that benefits Nova Scotia, the Atlantic region and Canada
- act as a key resource for government, industry and the broader community in a way that contributes to the development of Nova Scotia, the Atlantic Region, and Canada
- provide an environment in which our faculty, staff and students can thrive

Throughout this booklet you will find featured stories highlighting some of the outstanding work taking place in our Faculty. These stories exemplify what we strive to sustain and support with our Strategic Plan.

Robert Bauer Ph.D., P.Eng., FEC
Assistant Dean of Planning, Faculty of Engineering

You can find out more information about our Strategic Plan online at:

dal.ca/engineering/thinkersanddoers

VISION ONE

Deliver **outstanding education** in engineering and applied science to our students.

“There are huge benefits for the university and its programs when it engages in real-world problem solving.”

Sandra MacAulay Thompson
Engineer in Residence

Some of the ways in which we will ensure excellent teaching include:

- hiring full-time faculty dedicated to the first two years in Engineering
- creating comfortable and efficient classrooms
- furnishing safe teaching laboratory facilities that allow our students to engage in the most up-to-date laboratory work
- coordinating initiatives to attract more women into Engineering
- providing a broad offering of courses that meets the needs of students and encourages multidisciplinary learning

Engineers in Residence

CLIFTON JOHNSTON (NSERC CHAIR IN DESIGN ENGINEERING) WITH ENGINEERS IN RESIDENCE, FROM LEFT: COLIN DICKSON, ANDREA DONCASTER, CLIFTON JOHNSTON, GEORGETA BAUER, PETER GREGSON, SANDRA MACAULAY THOMPSON, AND KATHY LEA.

Industrial engineer Sandra MacAulay Thompson was looking for a way to return to the profession after starting a family when she heard about Dalhousie University's Engineers in Residence program.

"It was perfect for me because I didn't want to rush back into full-time work and this gave me considerable flexibility," says MacAulay Thompson.

"I get to assist students with capstone projects, build relationships between academia and industry and have family time so it's a dream come true."

MacAulay Thompson is one of six Engineers in Residence at Dalhousie University. In addition to mentoring and preparing graduating students for successful careers in industrial engineering, she is also consulting with maritime businesses to see how the program, university and students can resolve the design, process or production issues that are hampering their growth.

"There's huge potential for industry to benefit from the research that goes on at Dal, and the students who are here. And there are huge benefits for the university and its programs when it engages in real-world problem solving."

> "There's huge potential for industry to benefit from the research that goes on at Dal."
>
> **Sandra MacAulay Thompson**
> Engineer in Residence

Adds MacAulay Thompson: "I feel really lucky to work with such an outstanding group of engineers here at Dalhousie. They're all energetic, intelligent people who've accomplished great things, and they truly value engineering education. It's nice to be part of something that is giving guidance and support to the next generation."

Extracurricular clubs

LEFT: THE 2014 FORMULA SAE TEAM AT SILVERSTONE RACE CIRCUIT DURING THE 2014 FORMULA STUDENT UK COMPETITION.

ABOVE: THE 2015 FORMULA SAE TEAM. (PHOTOS PROVIDED)

As comprehensive as Dalhousie's Engineering program is, there are certain skills that textbooks and classroom instruction alone cannot quite deliver. That's where the university's extracurricular clubs and teams come in, providing students with experiential learning that is in a class all by itself.

"It's an opportunity for students to apply what they are learning while gaining a broad array of hands-on skills that help them succeed in the profession," says faculty engineer Piotr Kawalec.

There are currently four teams that students can participate in: the Concrete Toboggan team, which builds an entry for the Great Northern Concrete Toboggan Race; the ROV Team, which designs underwater vehicles for the MATE ROV competition; the Supermileage Team, which builds a fuel-efficient car for the Shell Eco-marathon Americas Competition; and the Formula SAE team, which builds and races miniature Formula One racecars.

"Although these teams are based around competitions, there are no exams, so students can work at their own pace and expose themselves to the full range of engineering disciplines and expertise," says Kawalec, who serves as a coordinator and technical advisor to the teams.

Several team participants have found the experience advantageous in securing employment. One student went on to help with the assembly line for GM's launch of the newly redesigned Camaro, while another is working at American Honda Motor Co. in research and development.

The clubs also offer an opportunity for faculty and students to engage in community outreach, promoting the program, and the profession, to young Nova Scotians.

"This year, members of the Supermileage team were involved in a summer camp Dalhousie organizes for elementary students," says Kawalec. "They created a workshop so kids could get an idea of how things are built, and we hope that experience inspires them to study here one day."

Kawalec is looking at the potential for more extracurricular clubs, something the new IDEA (Innovative Design in Engineering and Architecture) building will help make possible. "That building will give us the specialized shops and labs that will enable us to do more projects and involve more students, which is important, because it is a fun and invaluable experience for them."

> "Students can work at their own pace and expose themselves to the full range of engineering disciplines and expertise."
>
> **Piotr Kawalec**
> Faculty Engineer

Improving lives through design

KEILAH BIAS (RIGHT), WITH HUDSON GICHUNUKU, CHAIRPERSON OF THE MCOH DEVELOPMENT ORGANIZATION (SECOND FROM RIGHT) AND TWO OTHER CHARCOAL PRESS TRAINEES IN KENYA. (PHOTO PROVIDED)

When Dalhousie University instructor Libby Osgood traveled to Mikinduri, Kenya, in 2014, she decided to take along a prototype of a charcoal press created as a second-year design project by her Engineering students.

"The people there need fuel for cooking, but their process of making it is very tiresome and ineffective," explains Osgood, who visits the country each year as a Mikinduri Children of Hope (MCOH) volunteer.

"They use wood and only end up with small two-inch-by-one-inch briquettes. Deforestation is a big problem in Kenya and we wanted to determine if the charcoal press would be a better alternative."

As it turned out, the charcoal press not only helped preserve trees by using waste products such as dried cornstalks and banana leaves, it also significantly improved charcoal production.

"We actually improved efficiency about 60 times because you can make 16 longer and bigger briquettes at once," says Keilah Bias, who led the student design team. "As soon as we saw the impact the design could make to society, we decided to improve it."

Bias travelled with Osgood to Mikinduri in 2015 to promote and see how the press was being used in the community. She also taught students at Athwana Polytechnic how to manufacture the press, and hopes the knowledge transfer that occurred will further improve charcoal production while creating more income opportunities for Mikinduri residents.

"I feel like, by deciding to be an engineer, I've taken on the responsibility to make the world a better place to live in."

"We actually improved efficiency about 60 times because you can make...bigger briquettes at once."

Keilah Bias
Charcoal Press Design Team Leader

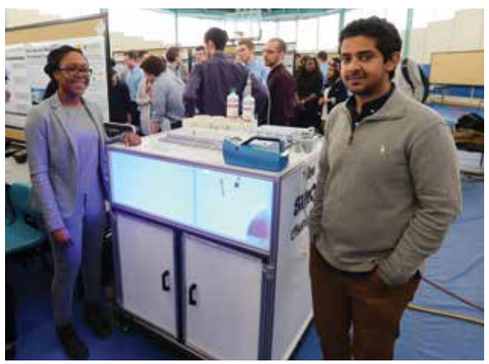
Engineering Design Expo

Faculty of Engineering students have the chance to showcase their skills at the annual Engineering Design Expo and Poster Competition which takes place in March during National Engineering Month.

The Expo highlights senior-year Capstone Projects, where students form teams to take on and resolve industry or community-based projects. Some projects are designed to be used by the clients, while others provide students with invaluable experience through real-world scenarios. Teams have the opportunity to draw on the experience and advice of the departmental Engineer in Residence.

"The Capstone Projects give students from all engineering disciplines an opportunity to use their technical and design skills, in a professional engineering setting, to see how they can benefit clients and society in their role as an engineer," explains Clifton Johnston, Associate Professor and NSERC Chair in Design Engineering.

"It's an incredible learning opportunity for the students, and the clients are always happy with the outcome."



"The Capstone Projects give students from all engineering disciplines an opportunity to use their technical and design skills... to see how they can benefit clients and society."

Clifton Johnston
Associate Professor

VISION TWO

Perform **excellent engineering research** that **benefits** Nova Scotia, the Atlantic region and Canada.

“There is potential to reduce our reliance on food for biofuel production.”

Dr. Azadeh Kermanshahi-pour

Assistant Professor, Department of Process Engineering and Applied Science

We will enhance our research and scholarly work by, for example:

- fostering a supportive research environment with access to state-of-the-art facilities and top-notch technical staff
- establishing areas of strategic research focus that can have a high impact in targeted sectors
- initiating a search for an Associate Dean of Research and Industry to help facilitate research and development among faculty and industry
- attracting top quality graduate students through research excellence and scholarship

Keeping tabs on ocean health

BOUSQUET SHOWCASING DALHOUSIE'S AUTONOMOUS SAILBOAT: A SILENT VESSEL TO ENABLE OCEAN MONITORING.

For millions of TV viewers, Space is the final frontier. For Jean-Francois Bousquet, it's the ocean.

"From defence to commercial fishing, there's a lot of activity going on under the water," says the Assistant Professor in Electrical and Computer Engineering. "But we don't know what the impact of all this activity is because it's very difficult to communicate under the water."

Historically, if you wanted to monitor that impact, you would deploy sensors to gather data and return to collect them up to a year later. It was an expensive process, not to mention impractical, given the constant changes taking place in the ocean. And if this harsh environment rendered a sensor completely useless, all that information was lost.

But Bousquet has been exploring technology that would change all that. Drawing on experience as a circuit designer for fibre optic communication systems, he's developing low powered embedded processors that will allow for real-time communication or transmission of information from deep under the sea.

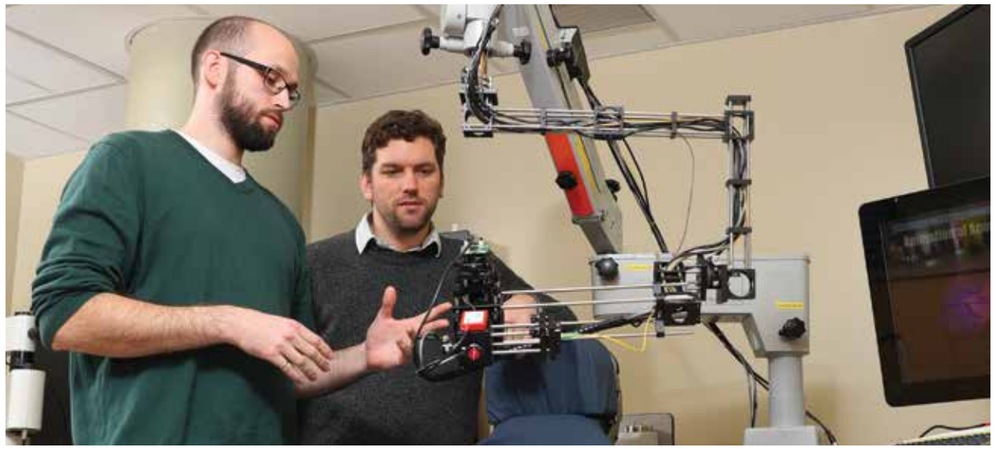
"The biological, chemical and physical conditions of the ocean – this technology could deliver it all instantaneously. Not just to oceanographers and scientists, but also to governments, military, oil and gas and anyone whose activity could compromise the health of the ocean. The possibilities are limitless."

Bousquet says there were several reasons why he chose to conduct research and development of underwater communications technology at Dalhousie, including a strong Oceanography program and access to vital equipment such as a seawater tank for conducting tests.

"The Department of Electrical Engineering and the Faculty of Engineering have invested considerable amounts of money into ocean technologies specifically. And the university has built relationships with local industries that allow for the necessary collaborations to make this happen."

The ultimate goal would be to, one day, enable video transmission under water. "That's the Holy Grail – how to get a camera streaming information back to the surface because that will give a much clearer picture of what's going on with our ocean."

Improving accuracy in medicine



DR. ROBERT ADAMSON (RIGHT) AND HIS PHD STUDENT DAN MACDOUGALL HAVE DEVELOPED A MICROSCOPE CAPABLE OF SEEING THROUGH THE EARDRUM INTO THE MIDDLE EAR. IT IS CURRENTLY BEING TESTED ON PATIENTS AT THE NOVA SCOTIA HEALTH AUTHORITY.

The human ear is an amazingly complex organ, and one that has, for years, posed problems for anyone trying to diagnose ailments or monitor post-surgery healing. But research being conducted at Dalhousie's School of Biomedical Engineering may soon change that.

Assistant Professor Robert Adamson is leading the development of an optical coherence tomography microscope that will do what no other non-invasive tool has been able to do: It will allow for imaging of the middle ear right through the eardrum.

"The structures of the middle ear are too small to adequately resolve with a CT or MRI," says Adamson. "This technology will deliver a very similar view to what you can see when the eardrum is removed, but without having to remove it."

Although other prototypes are in development, Adamson's is the first microscope in the world to be used on human patients. Currently working on a second generation system, Adamson says the potential impacts of this technology are tremendous.

"I'd like to one day see this in every ear clinic in the developed world."

Robert Adamson
Assistant Professor

"It will lead to more accuracy in diagnoses, and surgery that is more targeted. You can use it in the operating room to see if an intervention you've made has worked or not. And for the first time, we will be able to see how the middle ear is progressing through healing with imaging techniques."

Adamson says Dalhousie has proven an ideal environment to pursue this groundbreaking technology, giving him access to ACOA funding, collaboration with the QEII hospital, and support from the industry liaison office.

"The School of Biomedical Engineering has been essential in this initiative. My best students are recruits from the university's Electrical Department, and the Faculty of Engineering, particularly the Dean, have been very supportive of the research we've done."

Clinical trials are currently underway, with assistance from students Dan MacDougall and Josh Farrell, and Associate Professor of Otolaryngology Dr. Manohar Bance.

"We're talking to a couple of microscope manufacturers and I think there's pretty strong interest in it," says Adamson. "I'd like to one day see this in every ear clinic in the developed world."

Waste to valued added chemicals in a biorefinery scheme

STATE OF THE ART INFRASTRUCTURE ENABLES CHARACTERIZATION OF BIOMASS FOR IDENTIFICATION OF VALUE-ADDED PRODUCTS.

A Dalhousie researcher is exploring the potential to treat waste streams from fermentation plants such as corn-ethanol plant, while also producing biofuels and other value-added products.

"We know that the waste generated through the fermentation process is rich in organic carbon, nitrogen and phosphorous – all of which have an impact on the environment," says Dr. Azadeh Kermanshahi-pour, Assistant Professor with the Department of Process Engineering and Applied Science.

"We are investigating conversion of the organic carbon contaminants present in this waste into energy via anaerobic digestion. The remaining nitrogen and phosphorus can be removed by feeding the waste to microalgae. If we can screen microalgae species that are rich in starch, then we can recycle those microalgae to use as feedstock in the fermentation process to reduce our dependency on food-based feedstock, such as corn."

This integrated approach to waste treatment and biofuel production is unique in that waste is not only being used to produce energy through anaerobic digestion but also the effluent of anaerobic digestion, which is rich in nutrients can be used to grow microalgae as a source of biofuel. Furthermore, it can significantly improve the economics of biofuel production from microalgae, which is the main barrier to such use at present.

Dr. Kermanshahi-pour is also involved in a related research project that is exploring the potential to produce multiple valuable products from marine microalgae through integrated biorefinery. "For example, the metabolites that marine microalgae produce have applications in antibiotic development research. Our goal is to overproduce these metabolites and further extract them for use in drug development. The biomass left after the extraction of the primary valuable metabolite can be potentially employed for derivation of other useful products."

The goal is to eventually commercialize this integrated biorefinery process once proof of concept stage is completed. When that happens, Dr. Kermanshahi-pour says the impacts for our community, environment and economy could be substantial.

"There is potential to not only significantly reduce energy consumption of chemical plants and the environmental impact of contaminants, but also to reduce our reliance on food for biofuel production. That will lead to improved sustainability practices in our chemical plants by increasing the production efficiency, while protecting our health and environment."

New ways of thinking for business

COMPANY REPRESENTATIVE AND SOME MEMBERS OF THE DAL RESEARCH TEAM IN THE MAINTENANCE HANGAR, (FROM LEFT) LISA VAD, MARK MANSER, ELIZABETH CROTEAU, CLAVER DIALLO.

Every month, Jazz Aviation flies thousands of Canadians to destinations across North America. All that activity can be hard on their fleet of aircraft, and extensive maintenance and repairs are necessary to keep passengers safe, and flights on schedule.

But arranging ongoing maintenance for 116 planes isn't always easy, which is why the company has turned to Dalhousie's Department of Industrial Engineering for help.

Over the past eight years, co-op undergraduate and graduate students along with their professors have been working with the airline on a range of projects to optimize and enhance maintenance logistics. One prototype developed by the department will enhance spare part management, while another will enhance the workflow sequence for the company's heavy maintenance facilities at the Halifax Stanfield International Airport.

"We bring new techniques, new ways of thinking and new approaches to resolving issues," says Associate Professor of Industrial Engineering Claver Diallo. "Essentially, it's industrial engineering expertise, which is all about enhancing the efficiency of business. And we have the capability to help organizations of all sizes in all fields, from forestry to health care, throughout the region."

The Jazz Aviation prototypes mainly have been developed by students, with guidance from Diallo, Dr. Alireza Ghasemi, Assistant Professor of Industrial Engineering, and the late Dr. Eldon Gunn. "The students working on these projects are the best and brightest. They go into the company for two to three months to understand the issues and we work with them to come up with a solution. In fact, several of our students have gone on to work with Jazz full time as a result of their work."

Currently, Diallo and Industrial Engineering students are working with Jazz on a new prototype for more effective scheduling of crews on open travel legs to return them to their home base. It is, he says, one of many ways that Industrial Engineering and its students are contributing to community and economic growth.

"When we help our companies succeed and improve operations, that means employment opportunities for our students. So it's a win for us, for the organizations we work with, and for our communities. And it demonstrates that engineers can help make a difference in our region."

Story by Asha Katz

"We have the capability to help organizations of all sizes in all fields, from forestry to health care, throughout the region."

Claver Diallo
Associate Professor

VISION THREE

Act as a **key resource** for government, industry and the broader community in a way that **contributes to the development** of Nova Scotia, the Atlantic Region, and Canada.

“We can help Nova Scotia address the environmental challenge of discarded tires.”

Dr. Hany El Naggar

Associate Professor, Department of Civil and Resource Engineering

We will act as a key resource to government, industry and the broader community by, for example:

- increasing our involvement with granting agencies such as the Natural Sciences and Engineering Research Council of Canada (NSERC)
- cultivating direct industry interaction and involvement in both education and research
- increasing the portion of senior-year design projects that have industrial clients
- promoting more outreach with community groups

Building infrastructure from waste

ABOVE: HANY EL NAGGAR AND MOHAMMAD ASHARI CARRYING OUT LARGE-SCALE TRIAXIAL TESTING OF TDA/SAND MIXTURES.

LEFT: RECYCLED MATERIALS CAN BE USED TO CREATE GREEN INFRASTRUCTURE THAT REQUIRES LESS ENERGY TO CONSTRUCT AND MAINTAIN AND HAS A LOWER CARBON FOOTPRINT. FROM LEFT, JAMES SIMMONS, MOHAMMAD ASHARI, HANY EL NAGGAR, AHMED MAHGOUB, YURI MARTINS

Nova Scotia could become a world leader in addressing the environmental challenges of discarded tires, thanks to new research being conducted by Dalhousie University's Department of Civil and Resource Engineering.

Dr. Hany El Naggar, Associate Professor and Graduate Studies Coordinator with the Department of Civil and Resource Engineering, is assessing how tire-derived aggregate (TDA) – made from recycled tires – could be used in a wide range of civil engineering projects, including bridges, buildings and highways.

"We have a lot of soft soils in Nova Scotia that you cannot readily build on because they are too weak to support infrastructure," says Dr. El Naggar.

"When you use a TDA-soil mixture for the backfill, you have something that is lightweight but significantly reinforces the strength of the foundation soil. Now, you can build the structure you want on that soil, doing it economically without any risk that it will fail."

The TDA that Dr. El Naggar and his team of international students are testing is manufactured in Nova Scotia by Halifax C&D Recycling Ltd. It holds the exclusive contract to recycle the approximately one-million tires Nova Scotians discard annually. Given that 250-million tires are estimated to be discarded across North America each year, Dr. El Naggar says his research will help resolve the environmental and health issues they pose.

"We can help Nova Scotia address the environmental challenge of discarded tires. Discarded tires can be used to create green infrastructure that requires less energy to construct and maintain and has a lower carbon footprint."

"Tires are breeding grounds for mosquitoes because they pool water, and we've seen the dangers of that with the Zika virus. We've also seen the consequence of tire fires and the pollutants they release. If we can do this, and do it well, we can export this knowledge around the world."

Dr. El Naggar's team is also conducting a characterization study of Halifax C&D Recycling's TDA to establish product design standards, thus reinforcing the reliability of the product for use in civil engineering projects. He's optimistic that his work will create demand for the product locally and worldwide.

"TDA is both lighter and stronger than traditional soil backfill. It diverts waste from our landfills, turns it into a revenue stream and has a wide range of applications. Once we demonstrate that, we'll go from trying to create demand for TDA to having to keep pace with it."

EXPLORE

Dalhousie University's Faculty of Engineering is giving Nova Scotia girls in grades 11 and 12 additional encouragement to consider an engineering career through the EXPLORE summer program.

Now in its third year, EXPLORE Engineering Design is a two-week course that introduces participants to all aspects of the profession through hands-on experiences. In addition to building teamwork, presentation and computer skills, the course helps create familiarity with and connections at the University, and it can be counted toward the ENGI 1101 Engineering Design and Graphics credit.

"They really do a lot in the program," says EXPLORE instructor Libby Osgood. "They get to build, use the workshop, program robots, design and present their final designs to an audience that includes the client, parents, faculty and mentors. I really am inspired by how much work the girls do in such a short amount of time, how quickly they learn, and their eagerness to make the world a better place."

"I really am inspired by how much work the girls do in such a short amount of time."

Libby Osgood
EXPLORE Instructor

RUBE GOLDBERG MACHINES AND DEVICES TO HELP VISUALLY-IMPAIRED CLIENTS LOCATE BUS STOPS EASIER ARE JUST SOME OF THE PROJECTS BEING WORKED ON BY EXPLORE PARTICIPANTS.

Considering the need for accessibility

A unique class project gave Dalhousie University first-year engineering students the opportunity to explore concepts involving design and accessibility for the blind and visually-impaired community of Halifax.

In total, 402 students working in groups developed inventions to help with a wide range of activities and tasks from learning to play the guitar to the safe retrieval of kitchen knives dropped on the floor. These prototypes subsequently were displayed in a public showcase at the Halifax Central Library.

"As engineers we often forget that there are people besides ourselves that we are designing for," says Holly Algra, who oversaw the projects as instructor of the Engineering Design I class. "By giving the students a project outside the realm of their own experience, it forces them to consider and design for the needs of the world around them. The hope is that they continue to include accessibility in the other projects they undertake."

"As engineers we often forget that there are people besides ourselves that we are designing for."

Holly Algra
Instructor

ABOVE: BRENDON RAY DEMONSTRATES HOW A TACTILE BUS STOP WOULD ALLOW THOSE WITH VISION LOSS TO INDEPENDENTLY NAVIGATE THE TRANSIT SYSTEM

LEFT: ONE FIRST YEAR PROJECT ALLOWED CLIENTS TO BE NOTIFIED WHEN THEIR PLANTS ARE IN NEED OF WATER.

BELOW: DARK THEATRES CAN BE CHALLENGING TO NAVIGATE WITH VISION LOSS, WHICH PROMPTED THE STUDENT TEAM TO CREATE A WAY TO LIGHT STEPS FOR MORE INDEPENDENCE.

Ensuring safe drinking water for all

DR. GRAHAM GAGNON, DIRECTOR OF THE CENTRE FOR WATER RESOURCE STUDIES, IN HIS LABORATORY.

First Nations communities throughout Atlantic Canada are one step closer to having consistently safe drinking water, thanks to the Centre for Water Resource Studies at Dalhousie University.

The Centre has been working with the Atlantic Policy Congress (APC) of First Nations Chiefs to determine how best to address and implement the Safe Drinking Water for First Nations Act, which was passed in November 2013.

"It's proven somewhat challenging for these communities to implement the Act because of their size," explains Centre Director Dr. Graham Gagnon. "Of the approximately 33 First Nations communities in Atlantic Canada, the vast majority have a population of 800-4,000 people, so they each lack the technical capacity to do it on their own as an individual community."

What Gagnon has proposed, in collaboration with the APC, is a third-party, First Nations owned-and-operated water agency that could deliver service throughout the region.

"It's empowering. It gives the communities buying power for these services that they would not have had individually, and it's a means of building capacity because it creates career trajectories that First Nations youth can follow to become agency managers or engineers."

As development of the agency concept continues, Gagnon and the Centre have been working with corporate and government partners to conduct assessments of existing assets, develop regulatory frameworks and determine the necessary operating standards to ensure this initiative succeeds. While there are funding issues that need to be worked out if water services are to be delivered by a third-party agency, Gagnon is confident that this will be resolved in the near future.

"The federal government is asking us to have a solution in place over the next two years. It's a lofty goal given how many First Nations communities in Canada are on boil water advisories, but there's a strong willingness among all parties to make this happen. If we can aggregate services, then we can have agencies delivering safe, clean water to these communities in a sustainable way."

VISION FOUR

Provide an environment in which our faculty, staff and students can **thrive.**

“The experience and knowledge I have access to through the department is exceptional.”

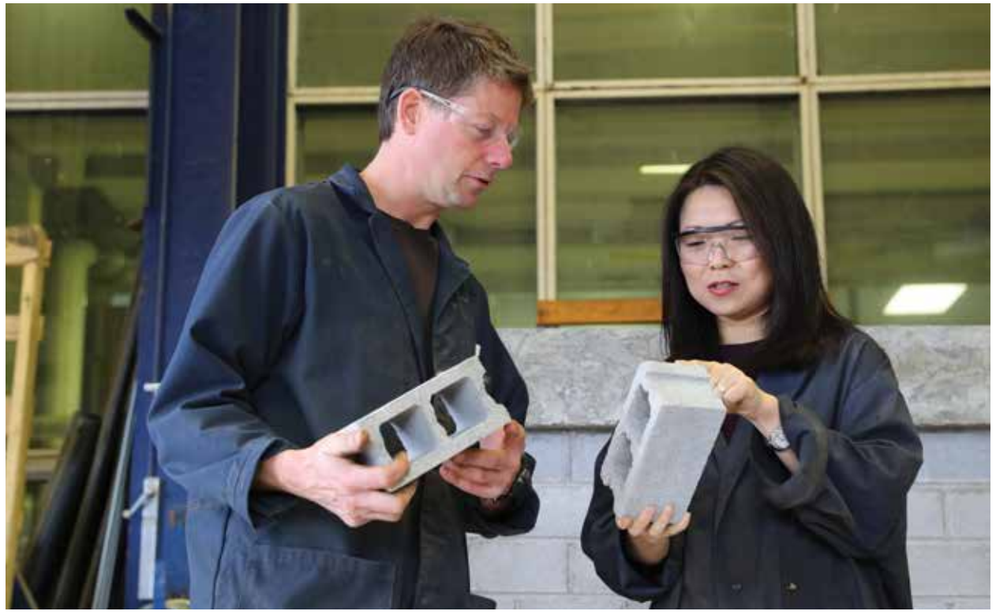
Dr. Yi Liu

Professor and Head of the Department of Civil and Resource Engineering.

Some of the ways in which we will make Dalhousie Engineering a great place to thrive include:

- further improving our ability to communicate our news and achievements with the wider community
- ensuring that all faculty and staff have opportunities for professional development
- further improving the Faculty website
- attracting and retaining outstanding faculty, staff and students
- expanding and modernizing our physical infrastructure by redeveloping existing space and constructing new buildings on the Sexton campus which will feature versatile rooms to meet our high-enrolment needs

The perfect environment for learning



YI LIU AND BRIAN KENNEDY DISCUSSING THE EFFECT OF MASONRY BLOCK GEOMETRY ON THE BEHAVIOUR AND FAILURE OF A MASONRY WALL SYSTEM.

When your research focus is on developing structural analysis and design standards that drive more safety and cost efficiency in construction, it helps to have a solid foundation for the work you do. Yi Liu says she's found that at Dalhousie University.

"To my knowledge, Dalhousie is the only university in the region that is currently doing any research related to masonry," says Liu, Professor and Head of the Department of Civil and Resource Engineering.

"The experience and knowledge I have access to through the department is exceptional, facilitating my work through collaboration on ideas. Dalhousie also has very strong industry connections, so I can ensure the research that I am doing is relevant to the concerns and requirements of this market. And the Dean has been very supportive of my work in terms of allocating the funding and space to do it."

Liu, who is particularly interested in masonry infill for steel or reinforced concrete frames and bracing requirements for steel plate girders, says it also helps to have access to some of the brightest young minds from around the world.

"Dalhousie continues to attract international students pursuing their Ph.D. designation, and they bring a lot of innovative thinking to the subject area. Plus with more faculty members joining the Civil Engineering Department, and ongoing investments in lab space, it makes for a perfect environment to do this work."

Enhanced student experiences

DR. CLIFTON JOHNSTON SPEAKING AT THE ENGINEERING DESIGN EXPO.

More Dalhousie Engineering students are graduating design-ready as the Faculty of Engineering continues to expand and enhance its learning curriculum and continuum.

In recent years, the Faculty has added design classes in each of the four years of the program, brought elements of design into more technical classes and tied capstone projects to industry issues and requirements.

"We've pursued a focus on problem solving," says Dr. Clifton Johnson, Associate Professor and NSERC Chair in Design Engineering.

"We're giving students a breadth of knowledge, tools and experiences for resolving any challenge, small or complex, so when they go out into the profession they're able to work through any situation they face."

That emphasis on preparedness is also being augmented through initiatives that extend somewhat beyond the classroom. Through the Engineers in Residence program, students have access to Professional Engineers who can help them navigate project work or explore career options upon graduation. And the IDEA Sandbox – developed in partnership with the provincial government and NSCAD – gives students an opportunity to explore product-based business ideas.

"The focus is slightly different with the sandbox, because it is encouraging entrepreneurship, but the fundamental objective is the same: you're taking a concept and working through it to achieve success," says Dr. Johnson.

"It's also invaluable in that they see how the work they do is multidisciplinary, involving other areas of expertise, such as business and design."

Dr. Johnson is looking to expand on that further, not just with a new multidisciplinary capstone course that is in development but also through the planned IDEA (Innovative Design in Engineering and Architecture) Building, which will lead to more hands-on multidisciplinary learning experiences for engineering students.

"We're going to be able to essentially double our capacity, offering access to new state-of-the-art learning space and tools that we don't currently have," says Dr. Johnson.

"Not only will we be able to launch more experiential learning projects, we'll be able to get more students involved in them. That means more breadth of experience in all aspects of design and related disciplines, and that will give them a real advantage in starting their careers."

"We're giving students a breadth of knowledge...for resolving any challenge, small or complex. "

Clifton Johnson
Associate Professor

IDEA Hub

ENGINEERING STUDENTS SAMUEL LEVAC-LEVEY (LEFT) AND ERIN PUGSLEY (RIGHT) WORKING WITH BUSINESS STUDENT SAM ALEXANDER (CENTRE).

Each spring, select Dalhousie students explore unique entrepreneurial ideas through the Innovative Design and Entrepreneurship Academy's (IDEA) Design, Development and Innovation Start-up boot camp.

This marked the second year for the boot camp, a collaboration between the Dalhousie Faculties of Engineering and Management, and NSCAD University. Over the course of the six-week camp, students form six interdisciplinary groups and turn product ideas into prototypes with the potential to be taken to market. Students also present their designs in a public showcase at the end of the camp.

"The IDEA Start-up boot camp is a tremendous opportunity for these students to take something from a theme to a business model with real commercial potential," says Clifton Johnston, NSERC Chair in Design Engineering and Associate Professor in the Department of Mechanical Engineering. "The innovation that the camp provides is a substantial experience for them."

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>
> **Clifton Johnston**
> NSERC Chair in Design Engineering

IDEA PROJECT CAMPAIGN

A new era of innovation - built on an "IDEA"

The $64-million IDEA project will reinvent Dal's Sexton campus.

Every great advance, every big step forward, begins with an idea — or, in the case of Dalhousie's downtown Halifax campus, an "IDEA."

That acronym — which stands for "Innovation and Design in Engineering & Architecture" — is a familiar one to many in the Dal community. For several years now, it's been used to describe planned future development on Sexton Campus to support Dal's Faculties of Engineering and Architecture & Planning.

Now, the IDEA Project has grown into a massive $64-million investment in Dal's downtown campus, thanks to support from donors, industry and the Government of Canada (whose $32 million contribution was announced Friday, September 30, 2016). Set to begin construction this fall, IDEA will not only revitalize Sexton Campus but truly transform it, making it the heart of Halifax's emerging innovation district.

Dalhousie President Richard Florizone calls it an "historic" initiative that will elevate design-oriented technical education and research at Dal to a global standard.

"The best university projects support our entire threefold mission — teaching, research and service — and this addresses all three so well," says Dal President Richard Florizone. "It strengthens engineering, architecture and planning education. It offers new, state-of-the-art space for research. And it's really going to make a huge impact on our ability to provide important support to entrepreneurs, local companies and NGOs, and our surrounding community in general."

Ryan McNutt, with files from Matt Semansky.

Support the IDEA Project Campaign
by making a donation online at

alumniapps2.dal.ca/giving/

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DALHOUSIE UNIVERSITY

FACULTY OF ENGINEERING

Built on a solid 100-year foundation, the Faculty of Engineering goes beyond traditional classroom education. Our professors provide students with real-world experience through participation in faculty research projects. Such collaboration gives students the vast set of skills necessary to become leaders. Nova Scotia Technical College, Technical University of Nova Scotia, and now Dalhousie have an extensive history of educating some of the best engineers in Canada, and we intend to keep doing that for a very long time.

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