ENGINEERING

MORE THAN ONE HUNDRED YEARS OF TEACHING AND RESEARCH EXCELLENCE

13 | SPRING 2019

LAB-ON-A-CHIP

ADVANCING OCEANS RESEARCH AT DAL

DALHOUSIE UNIVERSITY

FACULTY OF ENGINEERING

ENGINEERING

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Dean's Message

AT THE START OF THE ACADEMIC YEAR, we marked a milestone in the Faculty of Engineering. We officially opened the doors to two new academic facilities on campus: the Richard Murray Design Building and the Emera IDEA Building. Last month, we celebrated the launch of the Emera ideaHUB, an advanced incubator that empowers start-ups to create and build the next generation of physical products.

This was the final piece of the puzzle in what has become a continuum of design, innovation and entrepreneurship programming in our Faculty. This programming begins with our first year design projects and carries through the remainder of a student's undergraduate degree. Each step focuses on promoting design and innovation.

All the pieces of our academic puzzle are finally in place, and it's time to start thinking about our future. Where do we go from here?

To begin, we'd like to capitalize on opportunities the Emera ideaHUB will create for enhancing learning experiences. We are exploring new programs such as BUILD, which focus on each stage of product development. In collaboration with Dal's Faculty of Management, we are also aiming to create a Master's Program that will focus on integrating engineering, design and management of innovation.

The start-up companies accepted into the Emera ideaHUB have also had a positive impact on our students. This past year, four of our companies helped sponsor student Capstone projects. Several of these students will now be following on to work with these companies in the HUB. This is an excellent example of how we envision our programming evolving to create enhanced exposure to entrepreneurship for our students and cross-linkages between start-up objectives and education.

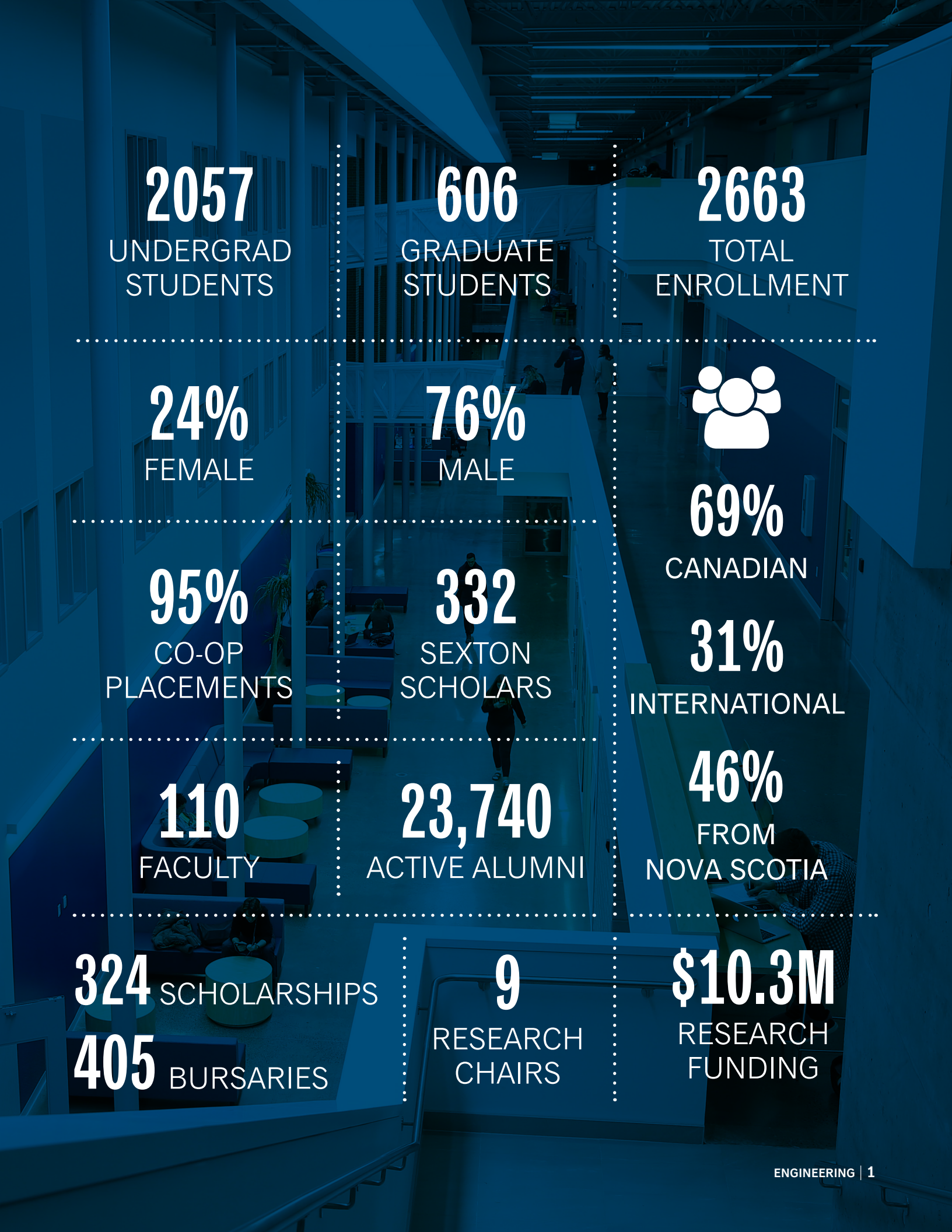
Elsewhere on campus, new research facilities such as our Advanced Manufacturing Hub and Oceans Hub are continuously generating research activity that benefit the community and offer more support and opportunities to students from diverse background to thrive. And going forward, that's our key focus: diversity.

Many of our top researchers, students and alumni are from diverse backgrounds, and this is an area we will continue to grow. We are creating an experience that shows these young creative minds that what they gain here goes beyond just their academic training. We are creating pathways to a lifelong career.

I hope you enjoy our Spring 2019 issue of Engineering, and I look forward to seeing you at upcoming alumni events.

Sincerely

John Newhook
Dean, Faculty of Engineering



2057 UNDERGRAD STUDENTS

606 GRADUATE STUDENTS

2663 TOTAL ENROLLMENT

24% FEMALE

76% MALE

69% CANADIAN

95% CO-OP PLACEMENTS

332 SEXTON SCHOLARS

31% INTERNATIONAL

110 FACULTY

23,740 ACTIVE ALUMNI

46% FROM NOVA SCOTIA

324 SCHOLARSHIPS

405 BURSARIES

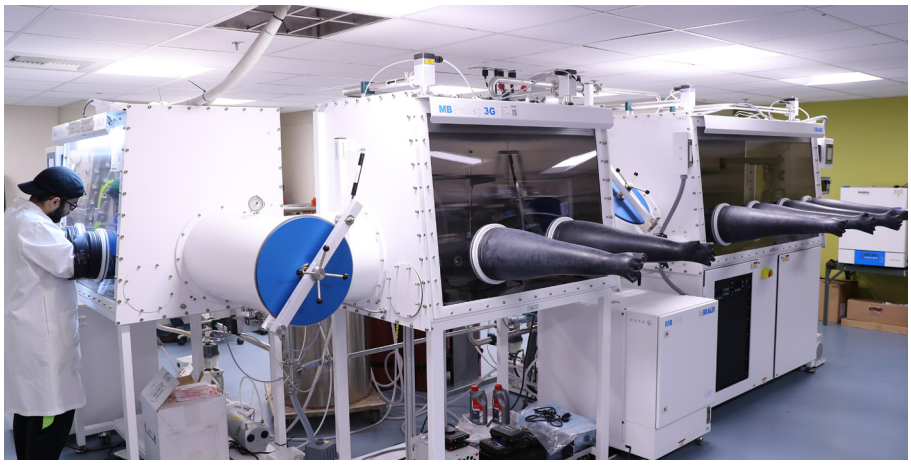
9 RESEARCH CHAIRS

$10.3M RESEARCH FUNDING

WOMEN IN ENGINEERING

While women remain underrepresented in the field of engineering, three remarkable innovators from Dal's Faculty of Engineering are making great strides in inspiring the next generation of female engineers.

Researcher energized by potential of nanomaterials



IMAGINE A WORLD IN WHICH everyone has access to technology that delivers clean, cost-efficient electricity, or firefighters have uniforms with sensors that warn them if they have been exposed to toxic gases. All of that and much more could be possible thanks to nanomaterial research being conducted by Dr. Ghada Koleilat.

Hearing Koleilat discuss the wide range of applications for the solutions-based materials she is exploring is enough to make you marvel at the seemingly limitless potential of this technology. But the Dalhousie University Professor of Electrical and Chemical Engineering and principal investigator at the Koleilat Research Group says they all have one thing in common.

"It is all about energy conversion and sensing. The solution-processed materials we are developing are semiconductor materials that could be used in any application that traditional semiconductors are used for – photodetectors, lasers, LEDs, or infrared sensors for biomedical engineering."

"The difference," she notes, "is that with this technology, we can do it all for a fraction of the cost and apply it to various surfaces that aren't accessible traditionally."

As the developer of the world's first functional colloidal quantum dot tandem solar cell, it is no surprise that Koleilat is primarily focused on creating a solution-processed material that can replace crystalline silicon technology in the manufacture of solar cells.

"If you look at the current modules, they are rigid, heavy, and large, which means it is more expensive and time consuming to install them on roofs, not to mention the fact they take up a lot of space," Koleilat says. "We are looking at the potential of using other materials in the manufacture of solar cells. It could be colloidal quantum dots, carbon nanotubes, organic polymers, or different forms of perovskite. But unlike crystalline silicon, which is grown epitaxially, we can deposit these materials from solutions using processes such as spin coating, spray coating, or dip coating, significantly reducing the time and costs involved in manufacturing a solar cell."

According to Koleilat, perovskite materials are particularly promising because these materials deliver energy efficiencies that are comparable to crystalline silicon.

"The problem is that the perovskites, for example, employ lead, which is toxic, so we are looking for ways to completely replace it. I expect we could have a solution for that in the next two to three years."

Koleilat is also looking at the potential of using nanomaterials to develop self-repairing solar cells, one of many other projects currently underway at her lab. Although she cannot provide many details regarding her work, Koleilat is optimistic that it could help bring renewable energy to places where people have not traditionally had access to electricity, and the impacts would be significant.

"Electricity is the currency of the world," Koleilat says. "If you don't have access to it, you don't have clean water, you cannot start your car, and you cannot study for school at night because you don't have a lamp. My hope is that, through this research, we can develop solar cells that are versatile, flexible, and can work where they are so we can bring clean, sustainable, inexpensive electricity to everyone and thus enhance their quality of life to an extent that previously would not have been possible."

Student devotes masters' project to changing lives in her hometown

FATOU SECKA had always dreamed of becoming a doctor. Growing up in the Gambia, the Dalhousie Civil Engineering Masters student had a strong desire to help others, especially given her country's struggling healthcare system. In 2012, before arriving in Canada to begin her university degree, Secka had the opportunity to work as a laboratory technician at the Medical Research Council (MRC) Unit in her hometown, Fajara. She says she remembers arriving at the clinic each day to find crowds of patients lined up at the front door. Some of the patients had been there all night hoping to be amongst the first to have their blood tested in the morning. Often many of these people would learn that they had malaria, a blood-borne disease prominent within the country. Her experience at the clinic stayed with her as she began her undergraduate degree in Sciences at Saint Mary's University in 2013. Although her plan had always been to study medicine, financial restraints changed her course of action. That same year, she began her Diploma of Engineering program at Saint Mary's University.

In 2015, she transferred to Dalhousie University for her Bachelor of Environmental Engineering. While working on a co-op term at the Center for Water Resources Studies, she was introduced to a 3-D printed microscope project that conveniently clipped onto her cellphone. The portable device was used to analyse water samples in the field.

"Then all of a sudden it occurred to me that this tool could be applicable in the health industry as well," she says.

Secka recalled her time at the MRC and the hundreds of patients who had to visit the clinic because they didn't have access to proper health facilities in their own villages. By the time some of those patients discovered their ailment, it was too late to save their lives.

"It occurred to me that this lens could be transported to their village through volunteer doctors and nurses, and used as a portable device to diagnose blood samples. The microscope could potentially allow you to see the malaria parasite."

In 2017, after tweaking the lens, she travelled back to the clinic to test out her theory. She worked with medical staff to identify limitations within the lens, and compared the tool to the same microscopes doctors were using to analyse blood samples.

"Some lens have such poor quality that it becomes very difficult to get magnified images. That means you won't be able to see the cells you're trying to examine," she explains. "I realized that the lenses I was using had many limitations and many other factors that I wouldn't want on a device that was being used for blood diagnosis."

She discovered one of the biggest setbacks was the possibility of people infecting their phones with blood samples.

"Let's say you're using your phone to look at a blood sample with a disease that is easily transferable, and it gets on your phone, you could try to disinfect the phone but you might end up putting yourself at risk and your family at risk."

Secka returned home inspired and motivated to positively impact others. Her solution was to develop an inexpensive reliable microscope that didn't require the use of a phone.

Now in the preliminary stages of development, Secka is working with professors in the mechanical engineering department to bring her idea to life.

Although the humble 26-year old prefers to remain behind the scenes, her masters' project has garnered a lot of attention in recent months. And while she hopes that one day her microscope helps improve healthcare in low income communities, for now, her work and determination are a true inspiration to other women hoping to pursue a degree in engineering.

"It makes me feel really good to know that I'm able to help others. I have this theory that no matter what path you find yourself on, you can positively impact someone's life," she says. "I hope I can inspire more women to pursue work in fields they may deem challenging."

Dal alum is a true inspiration to women across Canada

DENISE POTHIER'S (BENG'93 TUNS) determination, leadership and deep community roots are making a big impact on approaches to engineering design and practice. They're also making a significant difference to countless of young female students hoping to someday pursue careers in STEM (Science, Technology, Engineering and Mathematics) related fields.

In November of 2018, Pothier, a Dalhousie Chemical Engineering grad, was named a recipient of the Top 100 Canada's Most Powerful Women Award (WXN) in the CIBC Trendsetter and Trailblazer category.

The award celebrates the incredible accomplishments of Canada's top female executive talent, as well as their organizations and networks. The Trailblazers & Trendsetters category recognizes women who are either the first in their field, or have made a major impact on it, and who have made a great contribution to Canadian society.

With 25 years of experience working in the energy and resource sector, Pothier is currently serving as both Vice President, Practice Services and the first-ever Vice President, Indigenous Relations at Stantec. She has also been instrumental in helping to develop the company's Diversity and Inclusion Council.

Pothier, who grew up in rural Yarmouth County with Mi'kmaw and French Acadian heritage, has emerged as a leader in a predominantly male profession.

Pothier and her team work in collaboration with Indigenous communities to bring local knowledge and traditional frameworks together to complete projects that are reflective of the community.

"Often professionals feel the need to validate traditional knowledge in order for it to be considered scientific, not understanding that it is knowledge that has been observed and passed down for generations: it is already science," explains Pothier.

"We have been able to work in mutuality with Indigenous communities in North America and around the world, applying traditional knowledge to projects ranging from mining to wastewater management."

During construction of the Inuit Cultural Learning Facility in Nunavut, the Stantec project team met with local elders to learn about wind and weather patterns in the area. They used this traditional knowledge to design and build a centre with a roof that moves snow away from the building and is best suited to the natural environment and able to withstand the elements.

Other examples of Indigenous concepts that can be integrated into corporate culture and practice include two-eyed seeing, a Mi'kmaw concept familiar to most Indigenous cultures. It acknowledges the strengths in different worldviews and perspectives (Indigenous and mainstream) and thinking 'seven generations ahead': considering the impact of decisions we make today on future generations.

"For the vast majority of business operations, understanding and working with local Indigenous communities is critical. There is such richness and wealth of knowledge, you quickly learn what you don't know – it is very humbling."

Much of Pothier's work involves giving back by supporting outreach initiatives that help to strengthen communities in which she works.

"In order to design with community in mind, we have to be connected to our communities. It is the right thing to do," she explains.

Despite a busy work schedule with projects bringing her around the globe, Pothier is a councillor for Engineers Nova Scotia and past chair of the Women in Engineering committee where she started a mentorship program for students, junior engineers, and professionals. She sits on the board of directors of Techsploration and the Canadian Council for Aboriginal Business, and is a member of Engineers Canada Equitable Participation Committee, and is Chair of the Indigenous Peoples Participation in Engineering Committee.

Pothier says she's had to overcome no shortage of challenges during her life. "Being different, you have to stretch beyond your reach, push through the insecurity and self-doubt, and then you find you can do it. You make incremental steps and then all of a sudden you realize, you did it".

Her years of hard work, time and dedication to promoting diversity are a true testament to her WXN Award, and an inspiration to other females across the country.

"I didn't set out to make a difference – I just wasn't afraid to try. I realized it was going to be hard and that I was going to stumble, but I relied on my mentors and role models and kept going. Then all one day you suddenly realize you've become that person for others."

FEATURE

ENGINEERING INTO THE FUTURE

Lab-on-a-chip technologies advance Dal's reputation as a leader in marine research

THERE'S ALWAYS SOME TYPE OF QUESTION YOU WANT ANSWERED IN THE OCEAN, AND THOSE ANSWERS REQUIRE SENSORS, AND THOSE SENSORS REQUIRE ROBOTS

IN THE STAR TREK UNIVERSE, the legendary tricorder is an advanced device used to diagnose patients or to characterize the environment. No blood tests or invasive procedures are required in the analysis. Characters such as Dr. McCoy simply point the portable gadget at their patients, and instantly receive a diagnosis.

To this day, the multifunctional tool, which was used for data analysis, continues to fascinate scientists around the world, including Dr. Vincent Sieben. In fact, the Dalhousie University Faculty of Engineering professor was so captivated by the concept, he performed research to enable aspects of the device while completing his PhD in Micro-electromechanical systems and Nano systems at the University of Alberta.

From there, the Tricorder inspired Sieben's pioneering research in the lab-on-a-chip and microfluidics fields.

One may wonder what the two entities have in common. As Sieben describes it, much like the tricorder, a lab-on-a-chip refers to technologies housed inside a portable device that integrate one or several analyses, usually performed in a laboratory, onto a single chip.

Sieben is now bringing his extensive knowledge to Dal's Ocean's Engineering Hub and developing sensors to measure marine environments. Although lab-on-a-chip technologies have been around since the 1990s, their use in the deep ocean has only begun to evolve within the last decade.

◀ *(From left to right) Dr. Mae Seto, Dr. Vincent Sieben, Dr. Douglas Wallace*

Hired in March of 2018, the Sexton Chair in Underwater Sensing and an Associate Professor in Electrical Engineering, is developing tiny in-situ microfluidic sensors that will monitor nutrients, metals, hydrocarbons and microbes in the ocean.

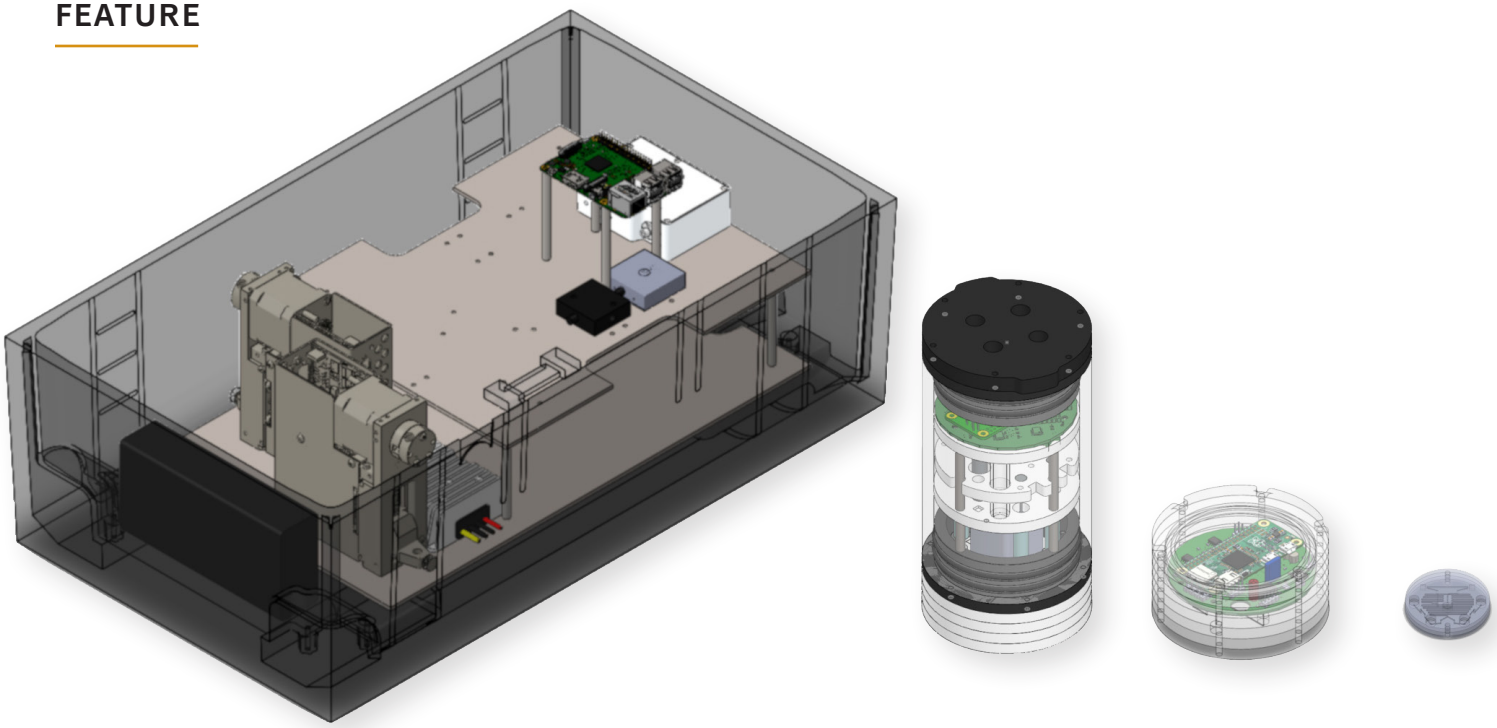
In collaboration with other researchers at Dal, including Dr. Mae Seto who was recently appointed the Irving Shipbuilding Chair in Marine Engineering and Autonomous Systems, and Dr. Douglas Wallace from Dal's Department of Oceanography, Sieben will integrate his sensors onto underwater vehicles.

The miniature chips are housed on a portable power system and then strapped onto Autonomous Underwater Vehicles (AUV) and deployed into the ocean. The sensors are intended to collect data within environments often too dangerous or too expensive for human exploration.

From there, the chips allow researchers to instantly measure valuable characteristics of the ocean's chemistry including nitrate, nitrite, ammonium, phosphate, silicate and iron.

Although oceans cover 70 per cent of the planet, they are presently under-sampled both spatially and temporally due to current approaches in data collection. Sieben says one of the main challenges in developing lab-on-chip devices for the deep sea is the design and fabrication of the device on a very small scale. These tools must be both cost efficient and functional, and of course, small enough to fit onto a small robot.

"The focus of our lab-on-a-chip program is to develop sensors that are better suited for long-term deployment at sea without having scientists themselves go out to collect the data," he says. "So if we have miniature sensors that are small enough to integrate onto these AUVs, and that consume very little power, then we can conceivably collect much more ocean data over space and time."



A sea of knowledge

TRADITIONALLY ADVANCES in lab-on-a-chip technology have focused mainly in the area of healthcare and recently in oil and gas. However, in 2008, a group of scientists at the National Oceanography Center in Southhampton, UK conducted research on the first lab-on-chip nutrient and microbiology sensors for the deep ocean. Their team of talented researchers included Dr. Vince Sieben.

Their chip, powered by a support system roughly the size of a large drinking bottle, was dropped into the ocean at a depth of 1600m and used to measure the temperature and salinity of the water.

"The professors who recruited me at the time had a vision of utilizing microfluidics in harsh environments. When it came to this type of technology, the work was a change in complexity that really excited me," says Sieben. "The thought of throwing a lab-on-a chip system in the deep blue put butterflies in my stomach. So, I joined their group."

Sieben says lab-on-a-chip integrates many areas of technology including microfluidics and nanofluidics. The devices incorporate several laboratory functions on a chip that ranges in size from a few millimeters to a few square centimeters. Sample analysis occur on location rather than being transported to a larger laboratory. He says the process, which helps achieve thorough automation, also reduces the risk of human error and interpretation.

"Many of the biogeochemical measurements performed on marine water still rely on wet-chemistry protocols. These include manual activities like mixing fluids, capturing particles on membranes, or measuring the color of a solution through absorption and fluorescence spectroscopy. When scientists perform these finely-tuned and sensitive processes in a laboratory, there can exist slight variations that yield dramatically different results," he says. "When we string these processes together on-chip, the sample never leaves our closed channels. It is treated the same as the 1000 other samples before it had been. This leads to unprecedented repeatability across a wide-range of users."

Following his work in Southampton, Sieben was a senior scientist at Schlumberger, the world's largest oil field service provider. He was the lead scientist on the revolutionary team that delivered the MazeTM SARA analysis, the first commercialisation of a microfluidic sensor in the oil and gas industry. The technology worked by coupling novel microfluidic chip technology and spectroscopy for precise measurements. The technology fully automated a more than 300 step process for testing geographically-diverse oil samples for saturates, aromatics, resins, and asphaltenes (SARA).

▲ *An illustration of Dr. Sieben's lab-on-a-chip evolution*

While working at Schlumberger, Sieben also had the opportunity to develop expertise in Autonomous Underwater Vehicles and Robotics for inspection and maintenance of subsea energy assets.

"What became apparent to me while working there was the fact there's a lot of infrastructure that humans have deployed throughout the ocean, but it can be quite costly to continuously monitor those structures," he says. "Ultimately, both the oil and gas industry and oceanographers are looking to reduce the cost of going out and gathering chemical and biological measurements at sea, and lab-on chip technologies are well suited to address these challenges when coupled with autonomous vehicles."

A new wave of oceans research

OVER THE YEARS, Dal has continued to solidify its position as a global leader in oceans research.

In the Spring of 2017, Faculty of Engineering Associate Professor, Dr. Mae Seto, was appointed the Irving Shipbuilding Chair in Marine Engineering and Autonomous Systems. Part of her research focuses on intelligent autonomous systems, and marine robotics, particularly for deployment in difficult environments such as marine and under-ice.

"One of the reason I like working with Dr. Seto is because she always says that her robots are there for a reason, and that reason is for the sensors," says Sieben. "Whether you're looking for nutrient trends like we're doing here at Dal, or monitoring infrastructure as we were doing at Schlumberger, there's always some type of question you want answered, and those answers require sensors, and those sensors require robots."

Last summer, Sieben and his team (Andre Hendricks, Cesar Rodriguez, Sean Morgan, Eddy Luy) created and tested Dal's first lab-on-chip sensor for the deep ocean. Deployment occurred in the heart of Halifax's Bedford Basin.

The chip, coined by Sieben as "Generation Zero," was housed in a self-powered system that included all of the off the shelf components required in developing a sensor, including tubing and wires. The box however was the size of a carry-on piece of luggage, and substantially too large to strap onto one of Seto's small underwater vehicles.

This summer, Sieben has removed all of the original off the shelf components to his model, and engineered a smaller and sleeker sensor that he plans to attach onto a Riptide, a long and narrow AUV, developed in Boston and used by Seto and her team.

"We've moved on to what I now call the first generation model which is a sensor that is the size of a 1 litre milk jug," he says. "I told my students that I want to see the evolution of the chip. I want to go from the big piece of carry-on luggage which we built last year, to the smaller tube we're creating now. Then I want to create an even smaller sensor hockey puck sized, and finally build something that's the size of a credit card."

Sieben says everyone is affected by the ocean, even if you don't live by the sea. As the world's population continues to grow, so do factors such as increased greenhouse gases, coastal development and land-use patterns.
These leave damaging effects on the marine ecosystem.

Sieben says in better monitoring our oceans, scientists can gather the critical information required in preventing future damage.

"What excites me about applying lab-on-a-chip technologies for ocean monitoring is the cross generational impact that it can have. When I look at my children's children, I'm hopeful that we will have figured out a way to either measure our impact on the ocean ecosystem or at least be aware on how we're disturbing them. Our sensors are at the core of that solution."

ENGINEERING THE FUTURE OF ADVANCED MANUFACTURING MATERIALS

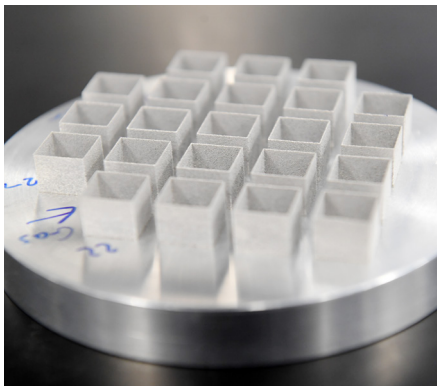
ADDITIVE MANUFACTURING (AM), is changing the way we make almost everything today. “Globally, companies are investing billions and billions of dollars in AM,” says Dalhousie University Faculty of Engineering Professor, Dr. Paul Bishop. “Everywhere, everyone is looking at this disruptive technology.”

That includes Dalhousie University’s new Advanced Manufacturing Hub.

A principal driver of growth in AM is freedom of design as it allows engineers to produce parts that would be challenging to fabricate by any other means. Although the technologies were originally developed for the production of plastic components, as AM continues to advance, metal powders are now emerging as staple feedstock materials. These include titanium alloys, nickel alloys, steels, and most recently, lightweight aluminum alloys.

“Lightweight materials are particularly crucial in the transportation sector where there is a compelling need to reduce greenhouse gas emissions. One of the main ways that this can be achieved is to reduce weight.” says Bishop. “In this context, aluminum alloys are apt to become the principal metallic materials utilized in AM as they reside amongst the lightest structural metals yet are also cost-effective” he adds.

The Advanced Manufacturing Hub recently received funding from the Canadian Foundation for Innovation (CFI) and the Nova Scotia Innovation and research Trust, to support the acquisition of new equipment for research on AM of metallic materials. Led by Bishop and his team, research within the Hub will focus primarily on the accelerated development



of innovative high strength lightweight alloys based on aluminum and titanium as well as high durability metal/ceramic composites.

Each material will be devised within a comprehensive research framework that addresses all stages of the AM production cycle including in-house production of the raw powder feedstock, consolidation of the powder into engineered components, post-build processing, and advanced characterization of the finished products.

BUILDING ON A HISTORY OF INNOVATION & SUCCESS

For nearly 20 years, Bishop and his team have conducted industry-sponsored research on the development and processing of innovative powdered metals.

“In the past, we completed pioneering work in the development of new aluminum powders specifically designed for powder metallurgy technologies” he says. “The main difference between AM

▲ *(From left to right) Mark Amagadzie, James Adye, Dr. Paul Bishop, Jon Hierlihy*

and powder metallurgy is the approach by which the metal powder is processed into a finished component. In the latter, powder is die compacted into the intended bulk shape and then sintered whereas in additive it is digitally built in successive layers."

Collaborating with industry giant GKN Sinter Metals, key outcomes of the research programmes directed by Bishop involved the creation of innovative aluminum alloys for high volume automotive applications.

One example is a patented formulation that offers exceptionally high thermal conductivity. This is now utilized in the commercialized fabrication of heat sinks that prevent critical electronic systems from overheating.

Bishop and GKN also developed and patented a metal matrix composite material comprised of a lightweight aluminum alloy coupled with a highly durable ceramic powder. This material offers exceptional mechanical properties and enabled GKN to launch the world's first aluminum planetary carrier.

"These products are great examples of how our research is designed around making new materials that out-perform the competition but in a way that ensures the end product is commercially viable," says Bishop.

PIONEERING NEW MATERIALS

Within AM technologies, metal powders are once again used as the feedstock material but, are typically consolidated into the finished product with a laser. There are however only a handful of alloys currently available for use within AM technologies.

"Dal has an exceptional aptitude for developing new materials. That's really where we shine," says Bishop. "We are now in an excellent position to apply this strategic knowledge in the accelerated design and development of innovative metallic materials for AM and capitalize on the tremendous growth opportunities that exist".

"Our patented developments have consistently hinged on the use of a powder with a unique chemistry. Historically, we've had to outsource its production to a third party. The chemistry itself is where the intellectual property lies so you don't like having to release that sort of information."

Bishop adds that the production of a single powder usually takes six months to complete, costs nearly $15k, and if the chemistry isn't correct the first time, the entire process starts from scratch.

The key accelerator of AM materials research within the Hub is the acquisition of a new gas atomizer designed for the efficient production of metal powders with almost any chemistry required.

"Using the gas atomizer we can make our own powder in-house with the exact chemistry that we want" he says. "Systematically, we can make a new powder in the morning, and then have finished parts made from it with our metal AM printers that same day."

Bishop says that alloy development cycles typically span six to ten years on average. However, with the new infrastructure, that will all change. "The incoming AM equipment will allow us to accelerate the pace of alloy development from years to days at a fraction of the cost. This is tremendously appealing to industry and will allow Dal to play a major role in the deployment of AM within businesses at regional, national and international levels"

WHERE IDEAS COME FROM

TAKE A STROLL around the Dalhousie's Emera ideaHub and it is immediately evident it is a place designed for building new physical products.

There's an enclosed room with 3D-printer technology, one outfitted with gear for building and testing electrical components, and another with tools for mechanical assembly — all nestled alongside a well-lit, open-concept workshop space generous enough to house the product prototypes created by up to a dozen startup companies at a time.

But this exciting new facility is about building much more than innovative physical products — it's about building the next generation of world-class technology companies.

Companies such as Aurea, a startup developing the world's first mini wind turbine that generates and stores energy for USB devices. And Graphite Innovation and Technologies (GIT) which is producing a graphene-based coating that protects ship hulls from corrosion and biofouling to improve the performance of a boat over its lifetime.

These promising young startups are among the first cohort of seven companies accepted to the Bridge residency program in the Emera ideaHUB, which celebrated its official opening in late April.

Housed in the Emera IDEA Building, one of two new buildings created as part of the $64-million IDEA Project revitalization of Sexton Campus that was completed last fall, the Emera ideaHUB empowers early stage startups and ventures led by students, faculty and alumni to create advanced prototypes and become investment ready.

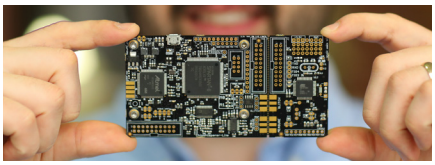
It does so by ensuring the firms are close to the facilities they need to design and build breakthrough physical technologies as well as the programming and industry connections they need for business development.

Operated by the Faculty of Engineering, the Emera ideaHUB includes a full-time engineering technical staff and specialized programming focused on building innovative physical products. Community partners such as Volta Labs and Innoacorp will help add another layer of support to companies coming through the Emera ideaHUB, providing programming and advice.

Here's a close look at two of the companies accepted into the Emera ideaHUB.

THE Emera ideaHUB GIVES US ACCESS TO EXPERTISE AT DAL, ALONG WITH EQUIPMENT AND R&D SPACE FOR THESE NEW DESIGNS

▲ *Dal alum and CEO of Colorsmith Labs, Gabrielle Masone*



▲ *(From left to right) Dalhousie Alum and NewAE Technology Inc. Co-founder Hilary Taylor, NewAE Technology Inc. Co-founder Dr. Colin O'Flynn.*

COLORSMITH LABS

Dalhousie University alum Gabrielle Masone is helping people with colour vision deficiencies see the full spectrum of the rainbow.

The 28-year old is developing a set of specialized contact lenses with light filtering technologies that will allow people to distinguish and perceive many of the colours associated with colour blindness disorders.

A long-time activist for vision care, Masone became inspired to help others with after having suffered from a condition known as Amblyopia. The condition left her blind in one eye.

"It was a pretty nasty experience, so I thought if there was something I could do to help other people with vision problems, then that's what I want to do," she says.

Although not life-threatening, colour vision deficiencies are inherited conditions that can affect one in every twelve men and one in every two hundred women. Masone says there are only a few solutions available to those who suffer from colour vision problems.

"Our contact lenses incorporate a light filtering technology that allows light to pass through the contact lens. The lens will allow you to distinguish between colours and see certain colours you didn't know existed before."

She says a portion of the equipment required to advance her research is the first of its kind around the world, and so are her specialized contact lenses. Her team will begin developing their prototype within the Emera ideaHUB.

"We need to have specialized equipment that you can't buy for less than a couple of million dollars; you have to build it, and that's what we're going to do here."

"We know that our product can help millions of people around the world, but to do that we need the support we can get right here in Halifax. The Emera ideaHUB gives us that support."

NEWAE TECHNOLOGY

Smart home devices such as televisions, thermostats, and door bells, are becoming increasingly popular, but they come with cyber risks. They're part of a network of physical devices tightly integrated with the internet.

Researchers predict by 2020, 50 billion items around the world will be connected to the internet. Unfortunately, many of these devices have vulnerabilities easily exploited by hackers.

"If you purchase any 'smart' product you are at the mercy of the company who claims the product is secure," says Dr. Colin O'Flynn, an alum and professor of Dal's Faculty of Engineering and co-founder of NewAE Technology. The company sells products and tools to make systems more secure.

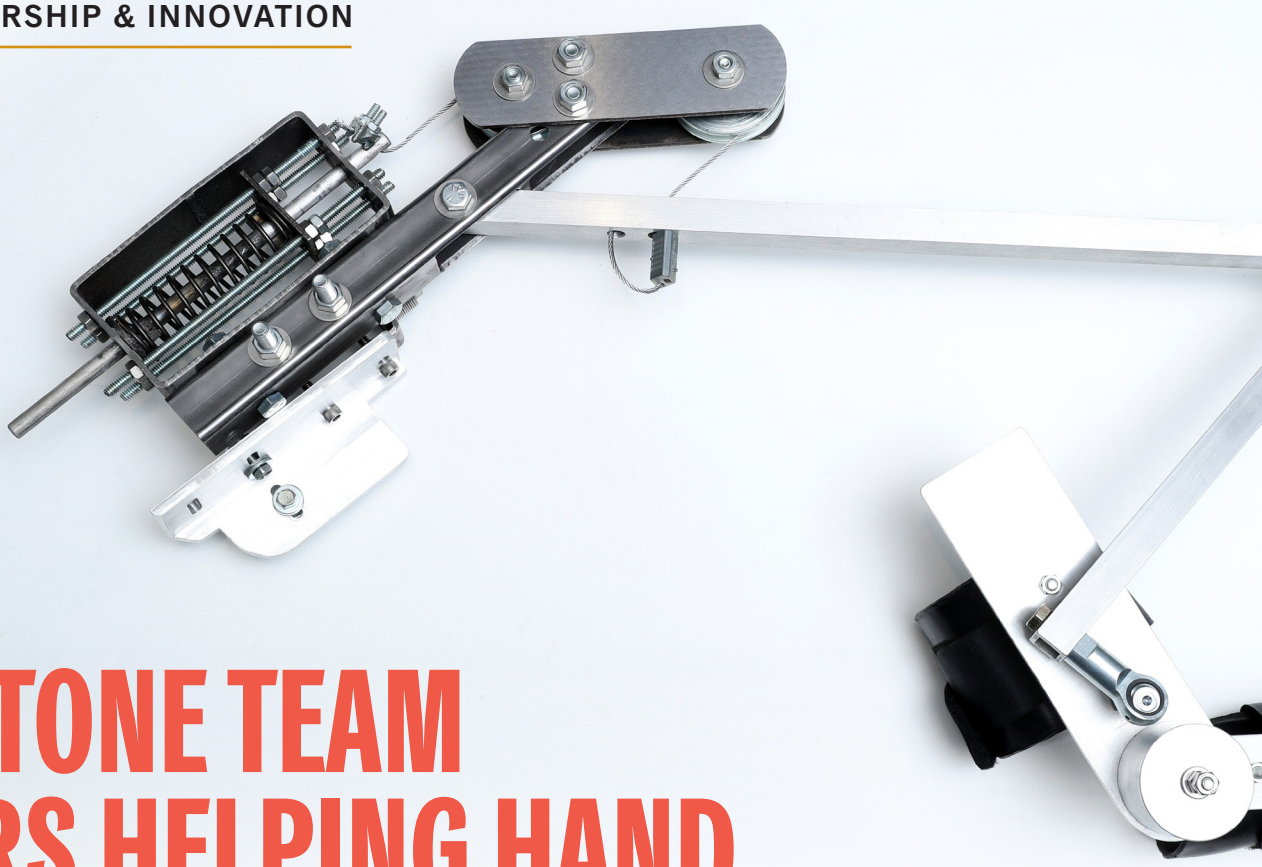
Their first product, labeled the ChipWhisperer, was created as part of O'Flynn's research work while completing his PhD in embedded hardware security. ChipWhisperer is now sold in over 40 countries.

O'Flynn says NewAE Technology is now in the process of designing next-generation products and new electronic test tools that will help customers evaluate more advanced threats. Product development will take place within the Emera ideaHUB.

"Some of our new products are going to focus on a precision electro-mechanical positioning system," he says. "This will flag flaws within systems vulnerable to several simultaneous attacks."

"The new products will work best with the ChipWhisperer," O'Flynn notes, "either as part of an improved system, or will perform a type of attack called 'fault injection' which causes computers to execute incorrect instructions."

"While we have an electronic R&D lab setup currently, there are a few products we've had in a planning stage that require more mechanical R&D. The Emera ideaHUB gives us access to expertise at Dal, along with equipment and R&D space for these new designs."



CAPSTONE TEAM OFFERS HELPING HAND TO A CLOSE FRIEND

"I WANTED TO DO SOMETHING FOR HIM THAT WOULD HELP HIM BETTER MANAGE HIS DAILY TASKS."

— BENJAMIN GALBRAITH

ENGINEERS ARE INVENTORS, visionaries, and problems-solvers trained to improve lives. Just ask Nathan Picard.

The 22-year-old suffers from Duchenne Muscular Dystrophy (DMD), a genetic disorder characterised by the progressive loss of voluntary muscle movement. Although he uses a wheelchair to navigate around his everyday life, he recently received some extra support from four friends in the Faculty of Engineering at Dalhousie University.

Mechanical Engineering students, Benjamin Galbraith, Shaymus Veinotte, Bill Parsons and Arvin Rahimzadeh dedicated their senior year Capstone Project to building their friend a helping hand.

They designed what they call a biomechanical arm assist, a portable device intended to attach onto Picard's wheelchair and assist with everyday tasks.

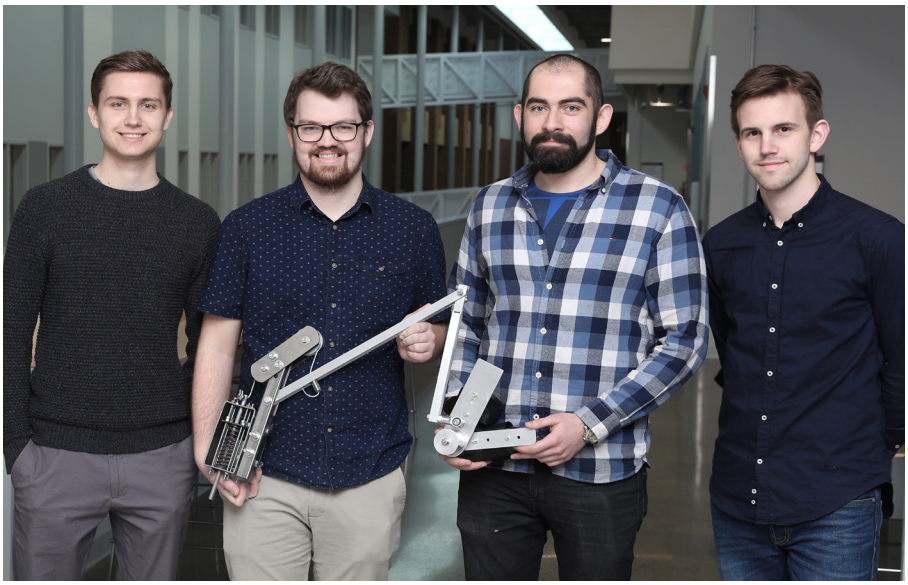
These tasks include eating and drinking which have become a challenge for Picard who struggles to lift his arm past his shoulder.

Picard was diagnosed with DMD at the age of six. The severe condition, which is more prevalent in males, is caused by an absence of dystrophin, a protein that helps keep muscles cells intact. Muscle loss often begins as early as the age of 3, affecting the hips, pelvic area, thighs and shoulders, and later the skeletal muscles in the arms and legs.

"We saw him digress throughout elementary school, junior high school and high school," says Galbraith who grew up in Mount Uniacke, Nova Scotia with Picard.

Although the two attended the same schools, Galbraith says he never really became friends with Picard until after high school. A friendship sparked through a love of gaming.

"We started playing Overwatch together, which is a video game," recalls



From idea to concept

▲ *(From left to right) Mechanical Engineering students, Bill Parsons, Benjamin Galbraith, Arvin Rahimzadeh, Shaymus Veinotte*

Galbraith. "We went to tournaments together and had a group of friends that we hung out with. A couple of times a year we'd try and get together to have gaming parties such as Mario Kart."

And it was at one of these parties where Galbraith really noticed some of the basic challenges Picard faced each day. While everyone sat on the couch enjoying a slice of pizza, Galbraith said he watched as Picard struggled to lift his slice of pizza to his mouth.

"Nate had to go over to the table and bend down to the level of the table so that he could eat," recalls Galbraith. "It was at that point when I realized that I wanted to do something for him that would help him better manage his daily tasks."

With the Capstone Project already on his mind, Galbraith teamed up with his mechanical engineering classmates to build Picard a biomechanical arm assist.

SENIOR STUDENTS in the Faculty of Engineering are required to undertake a Capstone Course in their final year of studies. The course, which promotes design and innovation, is the culmination of four years of studies and provides students with the opportunity to blend academic knowledge and experiences to tackle real-world problems.

While most student teams are partnered with members of industry and presented with a current problem they're required to solve, some teams are able to pitch their own Capstone Project ideas.

"I'd always been interested in prosthetics and trying to mix medical and engineering together, so I really wanted to do that with my Capstone Project," says Galbraith.

After examining Picard's arm strength and manoeuvrability, the team learned that they'd need to develop a device to assist with his elbow flexion, which is the contraction and extension of the arm at the elbow. The elbow flexion is primarily supported by the biceps brachii, which is an upper arm muscle that is greatly weakened in people who suffer from DMD.

"We're making his arm weightless, so that when he wants to lift a slice of pizza, the only weight he actually has to carry is the weight of the pizza, which is less than a pound," says Galbraith "His main problem right now is that he can't lift his own arm up which is about 10 pounds or so."

The arm assist is mounted to the side of Picard's wheelchair, and spring-loaded to counteract the weight of his arm. The team says once strapped to the wheelchair, the device can be appropriately tuned to adjust to Picard's weight.

"So if we can take a mechanism that supports his arm, and the springs inside the mechanism support the weight of his arm, he can use those to push his arm up," explains Galbraith

"When Nate slips his arm into the device, we also want to be able to adjust exactly how much weight we're assisting, just to make it perfectly balance his arm," adds teammate Parsons. "And also it's beneficial in case Nate's condition continues to digress."

When originally researching the concept and feasibility of their Capstone Project, Parsons says the team was surprised to discover that many electric wheelchairs currently on the market lack any type of arm support.

"For someone with DMD or other conditions, having full use and control of your arms is a huge aspect of being independent," says Parsons. "So this is a very important project to look into."

Although the team is quick to point out that their Capstone Project isn't designed to change the world, they know that with a bit more hard work and design iterations, they can at least change the life of one good friend.

SAVING THE LIVES OF STROKE PATIENTS IN NOVA SCOTIA

A STROKE HAPPENS when blood stops flowing to parts of your brain, permanently damaging neurons in the process. These cells are responsible for how we talk, move and think.

Though there are approximately 100 billions neurons in the human brain, stroke patients lose 1.9 million cells for every minute a stroke is left untreated.

"Stroke is the leading cause of severe disability in Canada, and the third-leading source of death," says Dalhousie Industrial Engineering Professor Dr. Noreen Kamal. "With a stroke, every minute matters."

Kamal has been designing and improving healthcare systems in Canada for over 15 years. Focusing on areas such as emergency department flow and management of sepsis, her primary research has been on acute stroke systems.

In fact, prior to her recent arrival to the Faculty of Engineering in January, she received national media coverage after significantly improving treatment times for acute stroke patients across the province of Alberta. Halving the number from 68 minutes to 36 minutes, stroke treatment centers in the province are now among the fastest in the world.

Kamal is now bringing her knowledge and research to Nova Scotia, and working closely with stroke neurologists at the QEII and the Cardiovascular Health Nova Scotia program of the NSHA to improve treatment times across the province.

She says hospitals in Alberta succeeded in fine-tuning their emergency treatment times by sharing and executing best practices.

Known as door-to-needle time, which is the time between when a stroke patient arrives at a hospital to the time they receive treatment, Kamal says a concerted effort led to a more seamless process between paramedics, emergency nurses, physicians and diagnostic imaging technicians.

"Stroke is treatable, but you have to be able to treat it fast in order to get back to your everyday life."

In Nova Scotia, 10 hospitals across the province are equipped to treat

"I AM HOPING THAT WE CAN MAKE THESE CHANGES ACROSS ALL OF ATLANTIC CANADA."

stroke patients, including the QEII in Halifax and 8 hospital are designated stroke centres. The QEII is also the only center in Nova Scotia able to deliver endovascular treatments, a minimally invasive surgery that mechanical removes the cloth from the patient's brain. The faster treatment is administered, the more efficacious.

Kamal says the first step in guaranteeing these treatments are administered quick enough is ensuring patients are transported to the right hospital.

"Typically when you have a stroke you're going to call 911," she says. "If you don't call 911 you'll probably end up at the wrong hospital. Paramedics know which hospitals are stroke centers."

In fine-tuning treatment times in Alberta, Kamal and her team recommended 4 key areas of improvement that helped cut down on critical minutes. These included pre-notifying the hospital in advance of an emergency arrival, developing a rapid registration protocol, moving patients directly to the CT scanner on the EMS stretcher, and beginning the administration of medical treatment in the CT scanner area. Kamal says all 4 processes together helped save over 30 minutes.

"When EMS paramedics notify the hospital, the hospital can then prepare for the patient to arrive. Some hospitals may look up a patient's history to see what drugs they are on. They'll also make sure the CT scanner is clear and ready to go, and then they'll meet the patient in the ambulance bay."

Kamal adds that leaving patients on the EMS stretcher and wheeling them directly into the examination room played a critical role in reducing the time it took to administer treatment.

"And the final big change was to administered treatment immediately after the CT scan was done rather then moving patients back into the emergency room and onto another bed," she says.

Although their methodology greatly improved treatment times in Alberta, Kamal says her team has only just begun to assess operations in Nova Scotia. She plans to improve access to endovascular treatment for patients in rural Nova Scotia, and improve door-to-needle times across the entire province.

GIVING MENTORSHIP TO THE LEADERS OF TOMORROW

Two Industrial Engineering alumni recognized as top co-op employers by Dalhousie

THOSE FIRST DAY JITTERS — we've all experienced them at one time or another. The little butterflies of anticipation at the pit of our belly that tell us we're about to start a new and (hopefully) exciting journey, while the apprehensive voice at the back of our mind questions our confidence.

But these first day nerves are considerably intensified when you've got little-to-no direct experience going into your role. This year, more than 2,000 Dalhousie co-op students, including Industrial Engineering students Laura Brenton and Melissa Gillis, found themselves in this very position. Like their peers, however, they were fortunate to join organizations that provided supportive supervisors who offered their time, guidance and expertise to help further the education of a new crop of professionals into the workplace.

Co-operative education can't succeed without a strong network of partners who support and mentor our students each and every year. This year, Dalhousie recognized the contributions of these partners at the third-annual Dalhousie Top Co-op Awards.

One event highlight includes the Top Co-op Employer awards. These student-nominated honours pay special recognition to the employers who provided students with work terms that were truly outstanding — as a result of the work environment, the assigned work projects, and perhaps most importantly, the supervision.

This year, employer winners included two Dalhousie Industrial Engineering alumni who were recognized for their efforts in 'hiring it forward' to a new generation of engineering talent.

INSPIRING THE NEXT GENERATION

The start of Laura Brenton's very first co-op work term included a move to rural Nova Scotia — in the dead of winter. Though she was just one face in a sea of over 1,000 others at Michelin North America's Granton Plant, the fourth-year student says she was made to feel valued from day one. She was provided with a comfortable apartment nearby and with office space thoughtfully situated around a team of knowledgeable engineers in her field, including her mentor Mina Koko (BEng '15).

In her award nomination, Laura credited Mina with playing a pivotal role in her career development. A supportive advisor, Mina worked closely with Laura, providing direction on work assignments while also encouraging her creativity, trusting her decision-making skills, and allowing her to take initiative. Mina's character and passion for his profession were inspirational to the young engineer, which she says "set a shining example of the characteristics I will strive for as I develop into a professional in the workplace."

AN INTEGRAL MEMBER OF THE TEAM

Project management had piqued the interest of fourth-year student Melissa Gillis in school, but she couldn't possibly know whether it was something for her until she had the opportunity to experience it first-hand. After a positive experience working with her supervisor Mark Staples (BEng '12) at the Nova Scotia Health Authority, she's found her career calling.

Though it was Mark's first time as a co-op supervisor, Melissa reveals that she'd never have known it. Always approachable, Mark was highly involved

▲ *(Top: from left to right) Industrial Engineering student Laura Brenton with award winner Ibimina (Mina) Koko (BEng '15)*

(Bottom: from left to right) Liam Shannon, NSHA, Industrial Engineering student Melissa Gillis, Mark Staples, NSHA

when needed, but offered plenty of independence to help her learn and grow. He took great care to show Melissa the ways in which her work was making direct impact in the areas of patient care, and would go out of his way to recognize her accomplishments and contributions, helping her see the meaning and value of the work she was doing each day.

MODELS FOR OUR YOUTH TALENT

Co-operative education enhances student learning through on-the-job application while contributing to the growth of our economy and professional work force. But co-op experiences wouldn't happen without the time and expertise from many incredibly hard-working supervisors, like Mina and Mark, whose mentorship help make the program so successful.

Congratulations to Mina and Mark, along with our other award winners. To learn more about hiring a co-op student, visit dal.ca/sitecoop.

LAUNCHING NOVA SCOTIA'S FIRST SATELLITE INTO SPACE

ARAD GHARAGOZLI CAN'T WAIT to look up at the stars and see his satellite orbit around the earth.

He, along with 50 engineering students from the Dalhousie Space Systems Lab (DSS) have been designing a small cube shaped satellite named LORIS (low orbit reconnaissance & imaging satellite) that will launch into space next year.

Their mission is part of the Canadian Space Agency's CubeSat Project (CCP). The initiative offers students a unique opportunity to design and build their own miniature satellites called a CubeSat.

As Project Manager, Arad says DSS is a team composed of students from undergraduate, masters and PhD levels.

"LORIS has seven subsystems and each team-lead oversees the R&D of their own subsystem," he says. "Each team lead then has a group of support engineers who have focused tasks and work to develop and complete their subsystems."

He adds that LORIS will be built of a lightweight aluminum alloy, and once complete will be 10x10x20 cm in size.

"MY ULTIMATE GOAL IS TO USE THIS OPPORTUNITY AND TURN DAL INTO ATLANTIC CANADA'S CENTER FOR SPACE FLIGHT ENGINEERING AND KICK-START A SPACE-BASED INDUSTRY ECOSYSTEM IN NOVA SCOTIA."

While the process of designing a satellite may seem challenging, Arad says his team has received a tremendous amount of support from Faculty of Engineering supervisor and professor, Dr. Kevin Plucknett, and other key resources around the world.

"Our team interfaces directly with CSA's Headquarters in Quebec. This enables us to communicate directly with CSA engineers, European Space Agency (ESA), NASA and several international space engineering firms worldwide," he says.

Once LORIS is complete, the team will transport the satellite to the Canadian Space Agency launch site in Florida. He says LORIS will orbit about 410km above the earth, feeding photos back down to his team.

"If the spacecraft performs as designed, it should provide us with frequent high altitude images that could be used to monitor the coastlines of Nova Scotia and Sable Island for erosion and assess coastal aquifer discharge with thermal imaging."

For Arad, the CubeSat project represents much more than a joint effort to launch Nova Scotia's first satellite into space. He says he hopes the initiative is a step forward to a much larger mission for both Dalhousie and the province.

"My ultimate goal is to use this opportunity and turn Dal into Atlantic Canada's center for space flight engineering and kick-start a space-based industry ecosystem in Nova Scotia. Currently we are focusing on space systems engineering, however, we are working to add rocketry and aerial robotics to our branches."

DAL ENGINEERING STUDENT HONOURED AS ROLE MODEL TO FEMALE STUDENTS

IF THERE IS ONE STUDENT with the potential to truly define and inspire the next generation of women in engineering, it's Sierra Sparks.

Sparks had always hoped to follow in the footsteps of her cousin, Kaitlyn McNutt, an alum on Dal's Chemical Engineering Program. She was inspired to pursue a degree in engineering after speaking with her cousin and learning more about the program's diverse and powerful impact on society. She says she remembers the day her cousin won the Canadian Engineering Memorial Foundation (CEMF) Undergraduate Ambassador Award and hoped one day she could also have a similar influence on young female students.

Her wish came true. In March, Sparks was honoured with that same award.

Although the third year Electrical Engineering student has a perfect GPA, the CEMF Undergraduate Ambassador Award is not a representation of a student's academic performance, but rather their passion and desire to motivate young women in engineering.

"I'd always hoped to be a role model to young girls, like my cousin was for me," says Sparks. "Promoting and being involved in engineering is my passion and I know how impactful it can be to have someone to look up to."

Although her list of extra-curricular activities is long and impressive, it's Sparks' passion for engineering that has truly made a difference in the lives of many young students across Canada.

"Whenever I'm talking to students in elementary school and high school, I love telling them about my own experiences in engineering. I truly believe that it's a career path that has something for everyone," she says. "I'm especially eager to spread the word to young women, and I'm proud to show them that there is nothing stopping them from pursuing engineering."

Sparks admits that as both a woman in engineering and a visible minority, she sometimes feels as though her skills are underestimated, but the judgement only fuels her drive to succeed.

"If someone believes that I can't do something, or that I don't "deserve" to be in engineering, then I am dead-set on proving them wrong," she says. "I think that it's important that women find what motivates them, and run with it."

INCREASING AFRICAN NOVA SCOTIAN ENGINEERS THROUGH IMHOTEP PROGRAM

AKILI CYRUS KNOWS HOW important it is to have role models who encourages African Nova Scotians to pursue careers in science, technology, engineering, and mathematics (STEM). For her, it was her sister.

That realization led Cyrus to Imhotep's Legacy Academy (ILA), an innovative Dalhousie University-community partnership dedicated to building skills, self-confidence, and interest in STEM fields among grades 6-12 Nova Scotian students of African heritage.

"I really liked the relationship I had with my tutors," says Cyrus, who is in her third year of mechanical engineering studies at Dal. "They helped put me on a path to study engineering and the experience was so enjoyable I started thinking about getting involved with ILA."

In October 2017, Cyrus did just that, becoming a virtual school program tutor. "I think many young people see significant barriers to entering fields such as engineering," she says. "By working with students to improve their grades and giving them advice, I can help them overcome those challenges."

Cyrus says it will be easier to do that with the opening of a brand-new ILA learning centre and maker space on Sexton Campus. The bold open concept will not only accommodate more students but also enable the launch of more enhanced and engaging programs.

Cyrus says it's been exciting to watch students excel in ILA and she hopes they go on to successful careers in engineering that inspire more African Nova Scotians to follow in their footsteps. "Representation is important in so many ways," Cyrus says. "It's that sense of belonging and community you feel not just on campus but in the workplace when you see more people who are like you. It's also the knowledge that the more you encourage diversity, the more perspectives and ideas you bring to the table, and that leads to better results both for the profession and for all Nova Scotians."

AFTER 50 YEARS, ANGUS CLOSES UP SHOP

I WILL MISS THE PEOPLE I WORK WITH, I'LL MISS THE STUDENTS, AND I'LL MISS THE FREEDOM I HAD TO RUN THE SHOP AS IF IT WERE MY OWN.

ANGUS MACPHERSON IS READY for retirement. Well, almost ready. The Department of Mechanical Engineering machine shop supervisor – a role he has held for nearly 40 years – admits he has not given much thought to what he will do beyond some woodworking, painting, and travelling with his wife.

"I've been too busy with student capstone projects this past winter to make big plans," he says. "But I am looking forward to it."

It is going to be quite a change of pace for Angus, who has been looking forward to each work day since 1968 when he joined the former Nova Scotia Technical College as a technician in mechanical engineering. But if anyone can navigate the transition to retirement, it is Angus. After all, he has spent more than 50 years tackling mechanical engineering challenges from students and researchers alike, so it stands to reason that he will embrace the transition to retirement with equal vigour.

"I've always loved solving problems and figuring out how to do things," Angus says. "I've been very fortunate to work in a university environment like Dalhousie because, unlike a commercial machine shop, you never know what you are going to be working on in any given day. There is always something new to build for a research project or proof of concept, and that's what's kept me here all this time. It's like being paid to do a hobby."

That said, there are not many people who could say they build heart valves and hip replacements as a hobby, but then even fewer could say that they have built a working escalator for rats as part of a kinesiology study. Angus can. "That was particularly interesting," he says. "It was part of a research project being conducted by the Department of Kinesiology. They wanted to study the gait of rats by filming them waking down a staircase, but they needed a way to transport the rats back to the top. It's amazing how many times you put more effort into thinking about how you will approach a project than actually building it, but that was one of them."

Given that nearly everyone who has passed through Dalhousie's campus since 1968 has worked with, sought advice from, or gotten to know Angus, it may be just as challenging for the university community to say goodbye to him. But Angus says Dalhousie will always have a special place in his heart, no matter where he goes or what he does.

"I will miss the people I work with, I'll miss the students, and I'll miss the freedom I had to run the shop as if it were my own," he says.

▲ *Dalhousie Faculty of Engineering Professor, Dr. Craig Lake has been inducted as a Fellow of the Engineering Institute of Canada (EIC). Each year, select individuals nationwide are recognized by the foundation for their excellence in engineering and services to both their profession and society.*

▲ *The Faculty of Engineering's focus on helping companies develop innovative products has led to a Guinness book of world record. The Shammal Bridge near Dubai, United Arab Emirates (UAE), was recently named the world's largest metal buried bridge with a span of 32.39 m.*

The project uses Atlantic Industries Limited new Ultra-Cor engineered structural steel plate developed in Dalhousie's Heavy Structures Lab.

▲ *Faculty of Engineering Associate Professor Dr. Amyl Ghanem, has been appointed the Faculty's new Assistant Dean of Diversity and Inclusion. Her role will advocate and support equity, diversity and inclusion within the Faculty. This includes creating an inspiring environment where women, Indigenous peoples, visible minorities and other groups are able to connect with others and explore studies and careers in engineering.*

▲ *Faculty of Engineering Associate professor, Dr. Mae Seto is the recipient of the Engineers Canada Award for the support of women in the engineering profession. Seto, who is also the Irving Chair in Marine Engineering and Autonomous Systems, received the award in May.*

The annual Engineers Canada Awards recognize engineering excellence and the recipients outstanding contributions to their communities, to their profession and to the safety and well-being of Canadians.

▼ *Government leaders, donors, the Dalhousie community and others gathered together in early October to celebrate the grand opening of Dal's IDEA Project: a $64-million renewal of Sexton campus that's sparking a new era in engineering and architecture and planning education.*

The transformation included the addition of two new academic facilities, the Richard Murray Design Building and the Emera IDEA Building, as well as substantial upgrades to five existing buildings. The IDEA Project — which stands for Innovation and Design in Engineering and Architecture — is the most significant transformation of Sexton Campus in decades.

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