INGENUITY

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APSC’s new dean: James Olson

In this issue, we feature the work of faculty, students, and alumni who are leading the way in their fields. We highlight their research, their contributions to society, and the innovative ways in which they are making a difference in the world.

DEAN’S MESSAGE

UBC’s Faculty of Applied Science (APSC) has long held a distinctive position within the university. Encompassing a broad range of high-impact fields, it offers uniquely practical, often immediately liberating opportunities that help students succeed in an increasingly competitive job market. At the same time, many of these opportunities also enable students to make a real-world difference by contributing to innovative research or entrepreneurial endeavors in diverse areas like biomedical engineering, architectural health, clean energy and Indigenous community planning.

But the needs of students, faculty members, employers and society are not static. Local and global forces — economic, social and technological, among others — are constantly reshaping the landscapes in which nurses, engineers, planners, architects and landscape architects operate. This means that we must frequently reevaluate how APSC can best serve the interests of all relevant stakeholders — including UBC as an institution, which recently released a new strategic plan that outlines its “vision, purpose, values, goals and strategies for the years ahead.”

APSC is ideally positioned to support this plan on multiple fronts. From interdisciplinary research clusters and experimental learning to sustainability initiatives and Indigenous engagement, our schools and departments are making great strides in nearly all the areas that UBC leadership has identified as holding significant transformative potential. One need only read this issue of Ingenuity to see examples of how our remarkable students, faculty members and alumni are achieving research excellence, furthering transformative learning and fruitfully partnering with communities both near and far.

Still, much work remains to be done. Addressing evolving student educational needs, helping to advance government and societal priorities through bold new projects, programs and partnerships, finding ways to more efficiently transfer knowledge from the campus to the outside world — these are just some of the challenges that we must grapple with every day. To do so most effectively, we need to establish a new strategic framework for APSC which ensures that our efforts synergize not only with those of UBC, but also with those of APSC-related professional bodies, the public and private sectors and society as a whole.

To this end, we have embarked on a 12- to 18-month process to develop a strategic plan that charts APSC’s course over the next five to 10 years. Involving the input of staff, faculty, students, alumni, industry partners and friends of the APSC community, the project offers a prime opportunity for the APSC community to come together to establish common goals and ultimately elevate the Faculty to new heights — all while reinforcing the culture of collegiality, collaboration and innovative thinking that has been a hallmark of APSC for over 100 years.

Best regards,

James Olson, PhD, FCAE, PEng
Dean, UBC Faculty of Applied Science

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Dr. James Olson

began his five-year term as the Dean of the Faculty of Applied Science on March 1, 2018. He is a professor in the Department of Mechanical Engineering and former associate dean of research and industry partnerships, and director of UBC’s Pulp and Paper Centre. Olson is an internationally recognized forest products researcher who has been actively involved in the transformation of the forest sector into a vibrant, diversified bio-products industry.

Q+A with the Dean

What quality do you most admire in a leader? There is what I consider a baseline of good leadership, which includes honesty, integrity and transparency. You cannot be a leader if you don’t possess these qualities. Beyond that, I have always admired the ability to motivate people and create a sense of community. I have tried to create that sense of community in the Faculty. To create a community of practice, including both industry and academic partners.

What makes UBC different? Being situated on the west coast of Canada makes UBC special and instills an inherent entrepreneurial spirit, as well as a strong environmental ethos. In addition to this, UBC is its own small municipality, which allows us to create our own “sandbox” for technology and policy. For our students and faculty within Applied Science, this means we are ideally placed to lead the way in developing new ways to focus on the human-centred, built environment.

What is the most important lesson you’ve learned in your career to date? I would say that the lesson I have learned is: “It’s more about the journey than the destination.” You cannot invest everything in the end game. You have to enjoy and celebrate the progress at every step, as you never know for certain how things will turn out.

How do you like to recharge? There is a particular spot on Shuswap Lake that I love to spend time at with my family and friends. It is way out in the woods with no electricity or Wi-Fi. It’s a fantastic place to read a book, think and recharge.

What is the best advice you were ever given? The outgoing Dean gave me some advice. He said: “Don’t let the things that you can’t change drive you crazy.” And he was right. Some things you can work on and other things are simply outside of your control. It is important not to lose sleep over the things you cannot change.

What potential does the Faculty of Applied Science hold? The built environment covers almost everything. Just about every object people use in their everyday lives has been mined or engineered. It extends to transportation, communication, energy, safe water and buildings (to name a few).

The Faculty of Applied Science has the potential to impact almost all the grand challenges facing society today, from climate change and health care, to economic development and creating safe, liveable cities. For us, the potential is endless.

James Olson, PhD, FCAE, PEng

Find James on Twitter and Instagram: @JamesDeanAPSC

APSC WELCOMES NEW HEADS AND DIRECTORS

In 2018, UBC Applied Science welcomed a number of heads and directors into their new roles.

Heather Campbell, professor and director, School of Community and Regional Planning is one of the world’s foremost planning theorists. She previously headed the University of Sheffield’s Department of Urban Studies and Planning. Her research explores how ethical values can be incorporated into public policy planning.

Steve Feng, professor and head, Department of Mechanical Engineering is the recipient of a UBC Killam Teaching Prize and is a Fellow of the American Society of Mechanical Engineers. His research interests are in the area of CAD/CAM/CAI (Computer-Aided Design, Manufacturing and Inspection).

Dean Maijer, professor and head, Department of Materials Engineering co-leads UBC’s Advanced Metals Processing Group, and directs both the Integrated Engineering Leadership program at UBC. His research focuses on the modeling of industrial materials processing including: heat transfer, fluid flow and stress.

Heather Campbell
Professor and Director, School of Community and Regional Planning

Steve Feng
Professor and Head, Department of Mechanical Engineering

Steve Wilton
Professor and Head, Department of Electrical and Computer Engineering

Daan Maijer
Professor and Head, Department of Materials Engineering

Find Heather on Twitter: @Heather accomplished

Find Daan on Twitter: @DaanMaijer
PERSONAL BELONGINGS CART READY TO ROLL | Graduate students at UBC Okanagan’s School of Engineering have developed a personal belongings carrier. Specifically designed with Kelowna’s homeless population in mind, the cart offers a secure alternative to grocery store shopping carts.

The carrier, which is partially constructed with composite materials designed in the Okanagan node of UBC’s Composites Research Network, is strong yet light, so that it can be easily manipulated along city streets. They are lockable and users can leave them while they attend appointments, get a meal or access other support services.

“The average person on the street has no desire to be there, nor do they want to use shopping carts. This provides a dignified alternative while they seek to get their lives back on track,” says Metro Community Church partner, Devon Siebenga.

AFFORDABILITY CRISIS REACHES VANCOUVER SUBURBS | A joint study between UBC SCARP and the Union Gospel Mission examines the growing threat of homelessness in Vancouver suburbs, as vacancy rates continue to decrease and rental costs keep rising.

Co-author Penny Gurstein, SCARP professor, says the trend has reached a boiling point, “The affordability crisis is particularly pronounced for low-income families because of low vacancy rates, rising rents and lack of adequate housing.”

Key recommendations from the report include increasing the stock of subsidized housing for low-income families, addressing income security and continuing the development of temporary modular housing are crucial steps in reducing homelessness within Metro Vancouver.

Read the full report at ugm.ca/affordability.

PROVINCE INVESTS $115 M IN NURSE PRACTITIONERS | In May 2018, Adrian Dix, Minister of Health, announced the province will invest $115 million over three years to create 200 new nurse practitioner (NP) jobs. In addition, the province has pledged to increase the number of NP education seats by six per cent.

The announcement was hosted by the School of Nursing at UBC’s Point Grey Campus and led by Director Elizabeth Sawcyew. The School will benefit greatly from the outcomes of this announcement — a team of NPs, NP students and NP faculty from the School were in attendance to show support.

According to Dix, “This is the largest investment in NPs in the province’s history and is a critical building block of a broader plan to improve access to primary health care.” Read more at kelownanow.com.

NEW FINDINGS IN TEEN DATING VIOLENCE | A collaborative study by Elizabeth Sawcyew, director of UBC School of Nursing, and researchers from Simon Fraser University is the first in Canada to look at dating violence trends among adolescents over time, and the first in North America to compare trends for boys and girls.

The findings show that while overall, teen dating violence is down, boys are more likely to report being the victim of violence than girls.

Read more at news.ubc.ca.

CELLPHONES AND CROSS-WALKS | Distracted drivers are responsible for more collisions in Canada than impaired drivers, but with smartphones becoming ubiquitous, distracted walking is also on the rise. UBC civil engineering Professor Tarek Sayed and his team have analyzed how mobile device use affects pedestrians, and the findings could help develop safer roads and program autonomous cars in the future.

“We found that more than a third of pedestrians were distracted by their cellphones, texting and reading or talking, and listening,” said lead author Rushdi Alsaleh, a civil engineering PhD candidate. Distracted pedestrians had more trouble maintaining their walking speed and gait, and took longer to cross the road, increasing the potential for conflict with vehicles.” Read more at news.ubc.ca.

RING THE ALARM | To prepare his recreational boat for the summer, Ian Grant (BASC ’71, ELEC) replaced two dead batteries with fresh ones from the lazarette. With a wrench he wound the terminals down, as he had many times before. Only this time he smelled burning sulfur.

Soon he couldn’t feel his finger. Grant realized his wrench — and his UBC Engineering iron ring — had created a current, almost an arc weld. Scorched to the nerve, the third-degree burn on his finger was painless, necessitating a visit to the burn clinic. The gauze dressing had to be changed daily for three weeks.

“I’m usually careful — and I’m an electrical engineer,” says Grant. “But sometimes your mind wanders.”

Grant advises other alumni to be cautious with their rings. He shares the story of a friend with the Vancouver Police who, while pursuing a suspect, caught his iron ring on a fence. “We forget we’re wearing our rings sometimes,” he says. “We become attached to them.”

But Grant isn’t seeking a replacement ring. “I’ve got a permanent one on my finger — this scar.”

GRIP ASSISTIVE DEVICE FOR QUADRIPLEGIC ATHLETES | As part of the UBC Engineers in Scrubs (EiS) program, a team of students has developed a grip assistive device targeted at quadriplegic tennis players. Partnering with the Rick Hansen Institute (RHI) — a not-for-profit organization focused on spinal cord injury research and care — the team produced a customizable “molded prototype” that combines hard plastic and softer fabric pieces to ensure a secure and repeatable grip while minimizing pressure and maximizing comfort.

The device placed second in the Innovative Design for Accessibility (1DA) student competition, which aims to inspire students to use their creativity to develop innovative, cost-effective and practical solutions to accessibility-related issues resulting in communities that are more accessible for persons with disabilities.

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BROTHERLY LOVE | In the summer of 2017, Michael Ko (third-year, Engineering Physics) received some devastating news: his brother, Daniel, who has muscular dystrophy, had gone into cardiac arrest. Thankfully, Daniel survived. But the event left him bedridden and with impaired speech due to a tracheostomy.

As Ko watched his brother struggle to execute tasks like turning on the lights or music, he knew he had to help. Gaining inspiration from some of his engineering physics courses, Ko designed and built a voice recognition assistive AI device that Daniel now uses to control electronics around his room.

Ko — who taught himself everything he needed to know for the project using online resources like YouTube and Stack Overflow — is continuing to optimize and expand the capabilities of his technology, which he plans to make public and hopes will help and inspire others in similar circumstances.

Read more at engineering.ubc.ca/newsletters.

Touchpoints Get caught up with the latest news from UBC Nursing with the fall/winter Touchpoints magazine — available online at nursing.ubc.ca/newsletters.

Ring the alarm To prepare his recreational boat for the summer, Ian Grant (BASC ’71, ELEC) replaced two dead batteries with fresh ones from the lazarette. With a wrench he wound the terminals down, as he had many times before. Only this time he smelled burning sulfur.

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Within hours of infusion, the six men who received TGN1412 were screaming and writhing in pain. Within two days, they were nearly dead. The men experienced a range of adverse effects — from crushing headaches and nausea, to lung and muscle pain and severe breathing problems — that culminated in multi-organ failure. In stark contrast to its impact on mice and monkeys, the drug had triggered an inflammatory onslaught from which their bodies may never fully recover.

While experimental drugs rarely kill or harm people, cases like TGN1412 serve to remind us what a risky and costly process drug development really is. Nine out of every 10 drugs fail in human trials; those that pass promise in animal models or the lab. One of the brightest spots in the 3D bio-printing landscape is Aspect Biosystems, a UBC spin-off company co-founded by Tamer Mohamed and Simon Bayer, graduates of UBC’s Department of Electrical and Computer Engineering (ECE). Konrad Walus, an ECE professor, and Sam Wadsworth, a researcher at UBC’s Centre for Heart Lung Innovation. Building on a decade of microfluidics research conducted in the Walus Lab, they have developed what may be the most sophisticated 3D bioprinting device on the market today.

Powered by their Lab-on-a-Printer™ platform technology, the BMT™ Bioprinter enables researchers to create complex, highly customized tissues in a precisely controlled manner. This flexibility is attributable in part to the company’s proprietary tissue design and fabrication software, as well as special printheads the company has designed which can combine different cell types, growth factors and other tissue components into cell-laden fibers and dispense these “bioinks” to print uniquely patterned 3D structures. Loaded with muscle cells from a donor lung, for example, the technology can fabricate a human airway that researchers can use to study bronchoconstriction and relaxation.

Testing a drug on 3D-bioprinted tissues could provide important safety and effectiveness information before it is administered to live humans — potentially saving billions of dollars, decreasing reliance on animal testing and producing drugs that are better, cheaper and safer. It could also enable the design of customized medical treatments and the fabrication of replacement organs from a patient’s own cells, thereby avoiding organ rejection.

Since 2016, Aspect has grown from eight staff members to nearly 80 and partnered with pharmaceutical and biotechnology companies such as Johnson & Johnson. Already recognized as one of Canada’s most innovative companies, Aspect is on a path to remain at the forefront of this fast-growing and revolutionary field.

For further information visit ubcinnovationprecinct.ca and cm.ubc.ca.

ROCKETING TO SUCCESS

Within a few years of its inception, the Master of Engineering Leadership (MEL) program is already bearing fruitful successes. In 2018 program graduates either founded or are integral to two companies on the Cleantech Emerging Rocket List, recognized for their “great potential for investment and market breakthroughs in the coming year” — the Rocket Builders’ lists recognize both established and emerging companies in the British Columbia’s tech sector.

While completing his degree, Amar Singh (MEL ’17, Clean Energy Engineering) is Director of Research and Development Marketing at Ionomr Innovations Inc — a company that designs and manufactures advanced ion-exchange polymers and membranes. He is responsible for evaluation and growth of new co-developement opportunities, supply on-shore and market outreach. With ground-breaking efficiency and durability, the company has raised over $3 million in angel funding and has been awarded $3.5 million dollars for its development of next generation materials, enabling applications in the hydrogen economy, energy storage and industrial waste remediation for the circular economy.

Ionomr’s product applications have a global reach, empowering companies in the low-carbon transportation and energy transition to optimize their system performance and cost, as well as bringing efficient solutions to treat waste and recover harsh chemicals from environmentally damaging industries using ionomer’s advanced ion-exchange materials. Belletti is a key influencer in the company’s business development. His extensive knowledge in the energy and electrochemical fields has been critical to his success; being attuned to the cost sensitivity and efficiency demands of the industry while ensuring minimal impact to operations during the transition to new membrane systems.

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COULD A DIY ULTRASOUND BE IN YOUR FUTURE?

Imagine an ultrasound device that is no bigger than a band-aid, which is both wearable, portable and can be powered by a smartphone. UBC electrical and computer engineering Professor Edmond Cretu and PhD candidate Carlos D. Gerardo, and mechanical engineering professor Robert Rohling have developed a new ultrasound transducer (patent-pending), or probe, that could dramatically lower the cost of ultrasound scanners to as little as $100.

Conventional ultrasound scanners use piezoelectric crystals to create images of the inside of the body and send them to a computer to create sonograms. The researchers replaced the piezoelectric crystals with tiny vibrating drums made of polymer resin, called polyCMUTs (polymer capacitive micro-machined ultrasound transducers), which are cheaper to manufacture.

“Transducer drums have typically been made out of rigid silicon materials that require costly, environment-controlled manufacturing processes, and this has hampered their use in ultrasound,” said study lead author Carlos Gerardo, a PhD candidate in electrical and computer engineering at UBC.

“By using polymer resin, we were able to produce polyCMUTs in fewer fabrication steps, using a minimum amount of equipment, resulting in significant cost savings.”

Sonograms produced by the UBC device were as sharp as or even more detailed than traditional sonograms produced by piezoelectric transducers, said co-author Edmond Cretu.

Read the complete story at news.ubc.ca.

BACTERIA-POWERED SOLAR CELL CONVERTS LIGHT TO ENERGY, EVEN UNDER OVERCAST SKIES

UBC chemical and biological engineering Professor Vikramaditya Yadav leads a study that has found a cheap, sustainable way to build a solar cell using bacteria that convert light to energy.

Their cell generated a current stronger than any previously recorded from such a device, and worked as efficiently in dim light as in bright light.

This innovation could be a step toward wider adoption of solar power in places like British Columbia and parts of northern Europe where overcast skies are common. With further development, these solar cells — called “biogenic” because they are made of living organisms — could become as efficient as the synthetic cells used in conventional solar panels.

“Our solution to a uniquely BC problem is a significant step toward making solar energy more economical,” said Yadav.

Solar cells are the building blocks of solar panels. They do the work of converting light into electrical current. Previous efforts to build biogenic solar cells have focused on extracting the natural dye that bacteria use for photosynthesis. It’s a costly and complex process that involves toxic solvents and can cause the dye to degrade.

This solution leaves the dye in the bacteria. They genetically engineered E. coli to produce large amounts of lycopene — a dye that gives tomatoes their red-orange colour and is particularly effective at harvesting light for conversion to energy.

Read the complete story at news.ubc.ca.

INNOVATION TO BRING CLEAN WATER TO MILLIONS

Circumstances sometimes bring the right people together to produce something very special. When Manoj Singh, president and CEO of Acuva Technologies, left the UBC–founded company Westport Innovations in 2014, he set off a chain of events that led to a water purification solution that is poised to have a major impact on the world.

Looking for a new business opportunity, Singh was particularly struck by an invention disclosure submitted by Professor Fariborz Taghipour. UBC Department of Chemical and Biological Engineering describing a drinking water purification method that used ultraviolet (UV) radiation generated by light-emitting diodes (LEDs).

Dr. Taghipour, an expert in photoreaction engineering, has worked on UV-based water treatment technologies for many years. “Every year several million people die as a result of water-related diseases, making them the leading cause of disease and death around the world,” Taghipour states.

When UV-C LEDs became available, my research group saw the potential and built an efficient UV photo-reactor operating with LEDs that worked brilliantly.”

LEDs have low power requirements; run cool, are long-lasting and maintenance-free, and do not have a negative environmental impact.

Singh and Taghipour quickly realized their shared interests and decided to start their own company.

Together, they developed a product strategy that initially leveraged the LED UV reactor’s low-power requirements for mobile, off-grid applications ideal for developing countries, where the need for safe water is the most evident. Their focused approach created a standalone, low-power, portable water purifier for off-grid use.

Driven by improvements in LED technology and the team’s patented technologies in optics, hydraulics, thermal management and more, Acuva was able to modularize their technology so that it could be used in water coolers/dispensers, refrigerators and even coffee machines.

This development has dramatically expanded Acuva’s potential, and brought the founding duo’s ideal of providing clean drinking water to millions within view.

In the near future, schoolchildren and office workers round the world could enjoy uninterrupted access to clean drinking water, all while potentially eliminating the use of up to 1.2 million plastic bottles over each unit’s lifetime.

Known as the Infrastructures Interdependencies Simulator, or i2SIM, the tool has already been used to map CI interdependencies across eleven European countries, as well as to prioritize steps to restore electrical power in Rome when a major blackout occurred. The success of i2SIM in these and other cases suggests that it could play a key role in strengthening mitigation strategies and emergency response plans on a multinational scale.

But the applications of the technology do not end there. “Theoretically, the simulator could be helpful in any area that involves thousands of data nodes,” says Martí. He and his partners are currently exploring the roles i2SIM might play in smart homes and smart power and distribution systems, as well as the financial sector. How should a city’s limited funds be allocated in order to achieve the greatest societal benefit?

ENGINEERING A DISASTER PLAN

As the frequency of natural hazards around the world continues to rise, the need for resilient cities has become more urgent than ever. So, José Martí, a professor in UBC’s Department of Electrical and Computing Engineering, and his team are developing a powerful simulation tool to fortify our critical infrastructures (CIs) — those facilities and systems whose failure would lead to death, economic devastation and societal upheaval.

How does the tool do this? First, by identifying the interdependencies that exist among the complex networks — water, heat, electricity, transportation — upon which all our cities depend. In the event of a disaster, the tool rapidly assesses the damage sustained by these key sectors, then determines the optimal allocation of the city’s available resources to minimize loss. In this way, it can provide real-time assistance to disaster response managers as they make crucial decisions following a catastrophe.

Read the full story at aps.abc.ca/news/ACSWA-Ingenuity.
SGAAWAAY K’UUNA

is a supernatural mystery-thriller set in 19th century Haida Gwaii; it is the first Haida-language feature film ever made.

The movie retells a Haida legend about a man’s transformation into Gaagiixid/Gaagiid, or the “Wildman.” But SGaawaay K’uuna has more in mind than telling a captivating tale. It also aims to inspire more people to learn the Haida language, which only a couple dozen people speak fluently today, as well as to promote economic development in the Haida archipelago.

The film was co-conceived and co-written by Leonie Sandercock, a professor in UBC’s School of Community and Regional Planning (SCARP), who has long been interested in the use of collaborative storytelling to help achieve real-world community goals. Supported by funds from the Social Sciences and Humanities Research Council (SSHRC), she will now study the film’s impact on the Haida community over the coming years.

“I think every member of the Haida community knows or has heard a version of the Wildman story,” says Sandercock. “The more we thought about that story, the more we thought that metaphorically it has contemporary relevance to Haida people since European contact … People have lost themselves — their culture, their language, their sense of humanity and connection. They lost them in residential schools. And today, people lose themselves to drugs. So the story could work on multiple levels, including metaphorically about addiction, and how you lose yourself when you become addicted. Can you be brought back into the community or not?”

Below is a timeline of this unique community planning project, from its earliest origins to release.

2004
Sandercock launches a new UBC course called “Digital Ethnographies in Urban Planning.” One of her first students is Jonathan Frantz (SCARP MA 2006), whose thesis focuses on the use of multimedia to enrich planning discourse and processes.

2010
Sandercock’s documentary film Finding Our Way: Beyond Canada’s Apartheid is released. It is an exploration of the struggles faced by Indigenous people through the stories of two First Nations in BC.

2012
A group of Sandercock’s students engages with the Haida community of Skidegate, which names language revitalization, job creation and protecting the natural resources of Haida Gwaii as its top priorities.

2012
Sandercock moves to Igloolik, Nunavut, a small Arctic community that is home to the production company Isuma (now Kingulliit). He begins creating video stories celebrating Inuit culture, history and perspectives with Zacharias Kunuk, one of Isuma’s co-founders and the director of Atanarjuat: The Fast Runner (2001) — the first Inuit-made, Inuit-language feature film (voted in 2015 by filmmakers and critics as the best Canadian movie ever made).

2013
Frantz introduces Sandercock to Norman Cohn, another Isuma co-founder.

2014
Cohn suggests that Sandercock make a fiction film instead of a documentary (for which funding might be harder to come by). The film — “about Haida, for Haida, by Haida” — could integrate both Haida dialects and employ Haida as cast and crew members.

2014
The project receives a $200,000 Social Sciences and Humanities Research Council (SSHRC) Partnership Development Grant — the Council of the Haida Nation, SCARP and IsumaTV begin to develop the film’s core concepts.

2018
In September 2018, SGaawaay K’uuna makes its debut at the Toronto and Vancouver International Film Festivals. It receives the VIFF awards for Best Canadian Film, Best BC Film and Most Popular Canadian Feature. In October, it receives the imagineNATIVE Film + Media Arts Festival’s Sun Jury Prize.
I am the only woman at the table. Again. I have been invited to speak to a project team, given my expertise on building information modeling. Although I have done this many times and have worked with many project teams, I still feel hesitant. I have been invited to the table but no one is speaking to me. As the silence stretches out, I get the familiar feeling that maybe I do not belong.

Then I speak. I present my experience, the results of my research and offer some recommendations. I am competent, confident and strong. The feeling in the room shifts. They give me their full attention. They treat me with respect. I leave the meeting feeling excited, relieved and included. This was 10 years ago but that experience still resonates today. The power of being invited and (eventually) included.

Now, I sit comfortably at the table. And I work to invite and include more women and other represented groups to the table. Not just because it is the right thing to do, but because it is the smart thing to do. Teams with gender diversity are smarter and more innovative. Diverse organizations perform better. And in any industry, better performing teams have better project outcomes.

At UBC, I have been working on this issue for the past five years. First as the inaugural holder of the Goldcorp Professorship for Women in Engineering, and more recently as the dean’s advisor on equity, diversity and inclusion. Our goal at UBC is 50:50 in engineering. We believe the engineering profession should reflect the society it serves, which means proportional representation of women and other underrepresented groups. Over the past eight years, we have gone from 18 to 30 per cent women entering engineering. We have been inviting girls, and they have responded. But to truly reach parity, equal representation at the table, will require an exponential shift.

Although progress on STEM occupations has moved moderately faster... it would take Canada 140 years to reach full parity.

We cannot wait that long. Industry and academia must work together to recruit and retain women in engineering. Now.

At UBC, we have significantly expanded our outreach efforts. Last year we reached 17,000 youth, half of which were girls. We now offer programming for girls in Grades 8 to 12, which allows them to try out engineering, to see how engineers are helping to solve important problems for society, and to meet role models. We are looking at the whole ecosystem in the pathway to engineering, offering training and support to parents, teachers and counsellors.

But to keep women in engineering, we have to look at the pathway to the engineering profession. The first five years is critical. We must provide a soft landing for women entering the profession and we must create truly inclusive cultures to keep women in the profession. Now.

At UBC, the long-term goal is to embed diversity and inclusion in all of our systems and structures. We recognize that this must be core to how we work. Within engineering, all of our first-year engineering students now receive training on bias, equity and inclusion. All students in the civil engineering program learn about the importance of teamwork and the critical ingredients of respect and inclusion in creating high-performing teams, which is taught in our core construction management class. We are now looking at how to incorporate this training and other mechanisms to create an inclusive and welcoming culture for all.

In every industry, organizations must thoughtfully and deliberately embed the principles of diversity and inclusion within their systems and structures as well. Think of what we have accomplished to create a culture of safety in our industry. How can we do the same thing to create a culture of inclusion?

changing the conversation

Not only is Colleen Ogilvie an engineer and UBC alumna but also an advocate for diversity in STEM. She is the founder and executive director of Engineers in Scrubs (EiS), a non-profit organization that aims to increase female engineering enrollment rates.

Ogilvie noticed that many students, especially women, are not aware of the diverse career options available in engineering. She says, “I realized I could study engineering and design for health and wellness. As a competitive swimmer and UBC graduate student, I knew I could make a difference.”

And yet many aren’t aware that engineers are attuned to problems in the everyday world. As a competitive swimmer and UBC graduate student in the fledgling field of biomedical engineering, Ogilvie noticed something about the swim bench in your average pool: it does not accommodate those with limited lower body strength and balance.

“I was always strong at math, but also interested in arts and design,” Ogilvie says. “I realized I could study engineering and design for health and rehabilitation.”

Aimed at transforming gendered perceptions of engineering, EiS offers professional development workshops for teachers and information sessions for parents to help change the conversation. Last year also marked the launch of Engineering Stories, a YouTube video blog aimed at transforming gendered perceptions of engineering. Why? To imagine yourself becoming an engineer. Dr. Stauf-French says, “I realized I could study engineering and design for health and wellness.”

In the last seven years, Badiei has travelled the world working with the Canadian Red Cross, the World Bank and Doctors without Borders. She has coordinated relief efforts in countries devastated by natural disasters, worked to restore essential services in conflict zones, and has helped to improve the energy supply to over 1.5 million people.

“Humanitarian aid and international development desperately need engineers, but it’s not really well known,” Badiei says. “That sense of direction early on opens you up to so many more possibilities.”

Sara Badiei has worked on emergency relief efforts in conflict zones including Gaza and Afghanistan. She also coordinated relief projects after natural disasters in the Philippines, and coordinated emergency medical operations for disease outbreaks in Chad and Congo.
The Next Generation of Bionic Devices

Inspired by the iconic scene of Luke Skywalker receiving an artificial hand in The Empire Strikes Back, UBC is focusing on the future of bionics and the next generation of bio-integrated devices.

Led by electrical and computer engineering Professor John Madden, the newly-formed Bionics Network connects over two dozen principal investigators at UBC, Simon Fraser University and the University of Victoria, working in areas such as advanced prosthetics, rehabilitation robotics, regenerative medicine and 3D-printed electronics. With specialties ranging across science, engineering and medicine, what brings these investigators together is a desire to deliver on the promise of bionics: the restoration or enhancement of human capabilities.

Bionics heating up

2016 was a watershed year for bionics. July saw the founding of Elon Musk’s new company, NeuraLink, which coincided with the launch of the US Defense Advanced Research Projects Agency’s (DARPA) new Neural Engineering System Design program, both aiming to develop implantable neural interfaces. In October, the world’s first bionics Cybathlon was hosted in Switzerland, with all the latest prosthetic technology on display. And climactically, in December, watching the LUKE Arm in motion is an inspiration to many. As one recipient, retired US Army Captain Artie McAuley, put it, “I’m getting to do a lot of things… I never thought I could. This has given me the opportunity to enrich my life.” And more changes are on the horizon. Brain-controlled neuromyoelectric prostheses are passing lab tests with flying colours, helping patients with locked-in syndrome to move objects using only their thoughts. Osseointegration is also gaining traction, which provides more natural and greater control by attaching a prosthetic device directly to the patient’s bone. With this recent wave of new technologies, it may be tempting to believe we’re tantalizingly close to the spectacle of science fiction. But, as Madden puts it, “We’re still a long way from the technological superhuman we see on-screen.”

Challenges to overcome

This year marks 25 years since the world’s first electrical limb, the Edinburgh Modular Arm System, was unveiled by David Gow. In that time, major advances have seen the production of softer, lighter, stronger and more life-like artificial limbs, leading to the LUKE Arm. However, the challenge of translating lab technology into better patient care is still as great as ever. Studies show that despite these major advances, up to 56 per cent of patients abandon the most cutting-edge electrical devices in favour of simple mechanical systems, (hundreds of milliseconds) and an average grip strength of around 100 pounds. In addition, the human hand contains over 17,000 nerves capable of detecting weight, firmness, shape, temperature and texture, feeding this information back to the brain via a two-way signalling network. And, if that wasn’t enough, the whole system is wrapped in a soft exterior suitable for human-to-human interaction.

How can bionics deliver on its promise?

The LUKE Arm would be indistinguishable from magic 50 years ago and it stands as a testament to how far we’ve come from Gotz von Berlichingen’s 16th century mechanical hand. But there is much ground to cover in bringing artificial devices to life. “Translating our technologies into better patient care is the goal of the Bionics Network,” says Madden. “This means working across boundaries to integrate teams and develop a new generation of devices that are softer, smarter and more sensitive.” For the Bionics Network, this will involve three key research themes: 3D printing to produce custom-fitted parts and reduce costs; soft robotics to exchange rigid components for softer, smarter materials; and bio-integration, to create devices that are compatible with the human body. Madden’s team at the Molecular Mechatronics Lab recently hit the headlines with the development of a soft artificial skin that can impart touch sensation to robots.

At a time when bionics is more popular than ever, the Bionics Network is bringing together scientists, engineers and clinicians to be at the forefront of this new generation of devices. By combining human biology, biomimetic design and the perspective of the patient, the group aims to deliver mobility, freedom and life back to many.

The Bionics Network is supported by the UBC Vice-President, Research & Innovation Office, in collaboration with the Institute for Computing, Information and Cognitive Systems (ICICS).
From an engineering perspective, we’re strengths in the quest for a solution.” and community development.

“From the structures to the communities, From life cycle analysis of the impacts of urban environments of the future. UBC engineering researchers and their interdisciplinary colleagues are building the multi-tiered plan evaluated four possible growth scenarios (ultra-compact, hub and spokes, urban centre and suburbs, and suburban development) and considered likely public acceptability to forecasted GHG emissions. Professor Sadiq, who led the project, says the insight from the other disciplines was integral to their results. “We were provided with many additional tools and variables that are typically outside the engineering scope, but enable us to make more intricate and educated findings.”


According to Professor Kasun Hewage, the opportunity for researchers to undertake such a diverse interdisciplinary project is unique. “Even in industry you aren’t often afforded the opportunity to diversify your knowledge and skills, and this project is enabling us to discover innovative solutions to help build Canada’s healthiest sustainable community.”

New Monaco Development

Designing the community of the future is in the hands of researchers at the Okanagan campus. Developers of a 125-acre parcel of land in Peachland have sought the expertise of researchers to help build a multi-use urban development that will eventually see a fully sustainable community of more than 5,000 residents. Working alongside colleagues from management and fine arts, engineering researchers are working on a range of projects including sustainable water and electricity supplied to recycling and transit.

Valerie Esson and volunteer students from the Okanagan campus.”

Wilden Living Lab

Two years into a three-year intensive research study comparing a home built to today’s standards to a home built with the latest energy-efficient materials and systems, researchers have already determined that the “home of tomorrow” results in energy savings of 65 per cent and costs savings of 35 per cent.

Lead investigator Shahrin Alam says these results may not be entirely surprising, “but providing homeowners and homebuilders with this type of analysis gives them the tools to make more informed decisions about what approach they wish to take in the future.”

The interdisciplinary project, funded by the Natural Science and Engineering Research Council (NSERC), brings together stakeholders from developers and builders to researchers and utility companies.

“Ultimately, our goal is to determine the best methods for creating a sustainable home of the future through material innovations, net-zero building planning, healthy neighbourhoods and renewable energy planning.”

Learn more at wildenlivinglab.com.

Timber-Steel Hybrid Structures

The rapid growth of Canada’s urban population and the associated environmental concerns are partly influencing city planners and construction stakeholders to consider sustainable urbanization alternatives. Sustainable urbanization has emerged as a viable solution towards smart and liveable cities that are more resilient, and environmentally friendly. With the advent of modern mass timber products, such as glued laminated timber, cross-laminated timber and structural composite lumber, these products are enabling builders to safely increase the height of wood buildings.

The building height limit can be increased, however, with consideration of timber-based hybrid buildings. Professor Solomon Tesfamariam and his group are leading research into this area, specifically the effective use of wood in mid- and high-rise buildings. They are developing hybrid structures that incorporate cross-laminated timber infill shear panels within steel and concrete frames. Through advanced modeling and testing, the researchers are assessing the effectiveness of hybrid buildings and their seismic performance. The results, along with other research currently underway into structural and life-safety building performance and building systems, are key to establishing new building code amendments and revisions.

Their work was supported through NEWBuildS – a multi-disciplinary NSERC strategic research network for engineered wood-based building systems – and Forestry Innovation Investment. Tesfamariam is extending this research further to incorporate green roofs to mitigate urban flooding.

Urban Densification Impacts on Kelowna

Working in conjunction with researchers in political science, economics and management, School of Engineering researchers at UBC’s Okanagan campus investigated the potential impacts of urban density on overall greenhouse gas (GHG) emissions.

The multi-tiered plan evaluated four possible growth scenarios (ultra-compact, hub and spokes, urban centre and suburbs, and suburban development) and considered likely public acceptability to forecasted GHG emissions.

Professor Sadiq, who led the project, says the insight from the other disciplines was integral to their results. “We were provided with many additional tools and variables that are typically outside the engineering scope, but enable us to make more intricate and educated findings.”

Despite the research identifying ultra-compact as the most effective GHG emission reduction development approach, interview data with land-use experts concluded that Kelowna would most likely continue to develop in accordance with the hub and spokes scenario.

“Our recommendations to the City of Kelowna were to engage the public to learn more about the impacts of varying types of developments,” explains Sadiq. “Ultimately, it is up to the public to make decisive choices to reduce GHG emission reductions.”

Although the research focused on the City of Kelowna, its findings are applicable to other similarly-sized communities across the country.

New Monaco Development

Designing the community of the future is in the hands of researchers at the Okanagan campus. Developers of a 125-acre parcel of land in Peachland have sought the expertise of researchers to help build a multi-use urban development that will eventually see a fully sustainable community of more than 5,000 residents. Working alongside colleagues from management and fine arts, engineering researchers are working on a range of projects including sustainable water and electricity supplied to recycling and transit.

According to Professor Kasun Hewage, the opportunity for researchers to undertake such a diverse interdisciplinary project is unique. “Even in industry you aren’t often afforded the opportunity to diversify your knowledge and skills, and this project is enabling us to discover innovative solutions to help build Canada’s healthiest sustainable community.”

Learn more at newmonaco.ca.

Lean more at wildenlivinglab.com.

Structures+ Communities Designed

Building safer, sustainable and more efficient homes and communities is the focus of urban infrastructure and green construction researchers at UBC’s Okanagan campus as they strive to find innovations that will change the future of way we live. The engineering researchers are partnering with researchers in other disciplines to bring a more holistic approach to the building process.

“From an engineering perspective, we’re taught early on to identify a problem and find a solution,” explains School of Engineering Associate Dean Rehab Sadiq. “But the real key is to bring together a strong team with different strengths and build upon those strengths in the quest for a solution.”

From life cycle analysis of the impacts of urban densification on the City of Kelowna, to detailed research and development of new building innovations, UBC Okanagan’s School of Engineering is teaming up with researchers from management, economics and health and social development to address the challenges within structural and community development.

From the structures to the communities, UBC engineering researchers and their interdisciplinary colleagues are building the urban environments of the future.
UBC SCHOOL OF NURSING CELEBRATES CENTENARY


Nursing students have a long history of engagement with UBC, beginning with those students who, in protest of governmental delay in building the campus, joined a parade — the Great Trek — from downtown Vancouver to Point Grey. In a photograph that may be familiar to UBC alumni, the nursing students can be seen holding their banner on the second story of the unfinished science building following the trek. In April 1923, the first nursing students initiated the UBC Nurses’ Club for graduates and undergraduates, in order to facilitate continued communication among nurses after graduation — an early alumni association. At around the same time, Florence Innes and Margaret Kerr, of the class of 1926, started a group for under-graduates in the degree program — the first iteration of our current Nursing Undergrad Society. According to Nurse Innes, “It was called the Science Girls’ Club because we were under the Faculty of Applied Science and our degree was Applied Science.” After graduating, some of the earliest graduates took positions in distant villages in desperate need of public health nurses — a practice that continues today. They travelled to their outposts by train and mail cart without as much as a telegraph to connect them to their families. Some of their duties included visiting schools where they checked for lice and tonsillitis and trained children who couldn’t afford toothbrushes how to clean their teeth with a soft cloth and salt. Other graduates accepted posts closer to home, in hospitals with the most current technologies, and in sanatoriums where they cared for patients with tuberculosis, still a leading cause of death at the time. Other graduates, as well as former faculty members, entered hospital administration, or banded together to form unions and associations to advocate for nurses across British Columbia and Canada at large.

And while graduates were changing the face of nursing, the School of Nursing continued to develop. The basics of research had always formed part of Bachelor of Science in Nursing (BSN) training, but...
the school’s first distinct course in research began with the introduction of the Master of Science in Nursing (MSN) degree in 1968. The school’s view of producing a core group of future researchers has been extremely successful, generating exemplary research and advocacy over the years. In 1991, the first PhD students took the next step to advancing their careers, a step which has contributed greatly to further enhancing our school with eminent scholars and mentors and attracting new educators to engage with current faculty in world-leading research.

Over these hundred years our graduates have defined and redefined what it means to be a nurse. From the first steps of the Great Trek, through women’s movements of the 40s and 70s — at the forefront of changes to abortion laws and the opening of birth control clinics — our alumni have not shied away from controversy. Both locally and around the globe, our nursing alumni advocate for vulnerable populations and push for changes in policy and practice. Today you will find them at work in women’s shelters and harm reduction clinics, striving to end the fentanyl crisis, breaking ground in the reduction of mental health stigma, developing policy for such citizens connected with our school and its core curricula and design- and building-related infrastructure. Students now have access to tools like laser cutters and 3D printers, which have already been incorporated into three SALA courses, as well as to a growing number of opportunities — both small-scale, “culture-and-skill-building” design-making projects and larger-scale, community-serving and field-based design-building projects — to learn existing practices and explore new architectural possibilities.

The Making and Building initiative at SALA is being spearheaded by Blair Satterfield, an associate professor at SALA. He and colleagues including AnnaLisa Meyboom, who leads the Robotic Fabrication Workshops for UBC, aim to help train a new generation of architects who are inspired to create structures that merge form and function in practical, sustainable and beautiful ways. “It’s probably safe to say that the future of architectural practice will involve an even stronger fusion of technology and traditional methods than exists today,” says Satterfield. “But whatever happens, it’s clear that we can no longer be content to simply refine our methods. We must enter the black box and program it, disrupt it and redirect its output to reach exciting new destinations.”

O

ver the past decade, the field of architecture has undergone a dramatic transformation. Thanks to advanced robotics and technologies like 3D modeling software and printers, today’s architects not only create innovative new designs for physical structures, but actually execute them in the real world.

At the University of Stuttgart, for instance, designers used digital fabrication tools to create a pavilion modeled on a spruce cone. Featuring a wood composite “skin” with 1,100 apertures that naturally open and close in response to changes in humidity, the structure represents what can be accomplished when modern technology is creatively applied to one of the oldest construction materials in the world. Merging mimetic design, materials and structural engineering, advanced fabrication and architecture, it also represents the benefits of taking an interdisciplinary approach to design and fabrication.

As architectural practice has come to require more than design and construction knowledge, schools of architecture need to offer training in engineering, computer science and other relevant disciplines if their students are to meet today’s professional demands. At UBC’s School of Architecture and Landscape Architecture (SALA), these skills are being imparted through a new program called Integrated Design Learning through Making and Building (IDLM&B@SALA), supported by the UBC Teaching Learning Enhancement Fund.

The Making and Building initiative at SALA is not just another curriculum-design project, but rather one that mirrors and responds to a profound technology-driven revolution in the profession,” says Ronald Kellett, the director of SALA. “We need to reimagine the ways in which we teach courses in digital media, design and technology if we are to remain at the forefront of this rapidly evolving field.

In the past, design and fabrication were segregated processes that called for largely distinct skillsets. But with the emergence of powerful new digital technologies, the two now go hand in hand. Computational design methods are heavily informed by the performance of fabrication tools (and vice versa), and understanding the foundational principles that govern these technologies — not just learning the software that happens to be popular at the time — is crucial for any architect who intends to thrive professionally.

In order to help its students achieve this, SALA has embarked upon a three-year plan to expand its core curricula and design- and building-related infrastructure. Students now have access to tools like laser cutters and 3D printers, which have already been incorporated into three SALA courses, as well as to a growing number of opportunities — both small-scale, “culture-and-skill-building” design-making projects and larger-scale, community-serving and field-based design-building projects — to learn existing practices and explore new architectural possibilities. IDLM&B@SALA is being spearheaded by Blair Satterfield, an associate professor at SALA. He and colleagues including AnnaLisa Meyboom, who leads the Robotic Fabrication Workshops for UBC, aim to help train a new generation of architects who are inspired to create structures that merge form and function in practical, sustainable and beautiful ways. “It’s probably safe to say that the future of architectural practice will involve an even stronger fusion of technology and traditional methods than exists today,” says Satterfield. “But whatever happens, it’s clear that we can no longer be content to simply refine our methods. We must enter the black box and program it, disrupt it and redirect its output to reach exciting new destinations.”

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### 2019 CENTENARY EVENTS CALENDAR

**FEATURES**

**DIALOGUE ON NURSING’S ROLE IN INDIGENOUS HEALTH IN BC**

**JANUARY-OCTOBER 2019**

**UBC NURSING DIALOGUES**

Nursing-Literature, Dialogue, and Best Practice with Indigenous Assistance in Dying (MAID)

FEBRUARY 12, 2019

**CONSORTIUM FOR NURSING HISTORY INQUIRY SYMPOSIUM**

100 Years of University Nursing Education: Looking Back and Looking Forward

MARCH 14, 2019

**EDGE FESTIVAL**

APRIL 4, 2019

**GALA**

MAY 2, 2019

**CONGRESS OF THE HUMANITIES AND SOCIAL SCIENCES**

JUNE 12-15, 2019

**ORIENTATION OF THE CENTENARY CLASS**

AUGUST 2019

**VERNA HUFFMAN SPLANE PUBLIC HEALTH NURSING LECTURE**

OCTOBER 2019

**MARION WOODWARD LECTURE**

NOVEMBER 2019

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Each year, we choose our students from a pool of remarkable, clever and accomplished applicants. This year, each one also has the distinction of being among the one hundred cohort of nursing students to attend our school, and will be recognized with a special welcome at orientation.

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Beginning in January, look for a series of dialogues that will align with the Truth and Reconciliation Commission calls to action. Hosted by Nursing’s Indigenous Cultural Safety Strategic Initiatives Committee.

The first in a luncheon series on pressing issues fully moderated by Dr. Sally Thorne, professor UBC School of Nursing and Associate Dean, Faculty of Applied Science. Look for three more of these quarterly UBC Nursing Dialogues planned throughout the year.

Opening lecture presented by keynote speaker and UBC School of Nursing alumnus, Dr. Susan Duncan, Professor and Director, School of Nursing, University of Victoria.

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Join us as we celebrate the gifts and talents of our colleagues and partners in honour of our centennial, we will be awarding 100 Centenary Medals to recognize individuals connected with our school who have made distinguished contributions and support to nursing practice, research, or nursing education.

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A Member of the Order of Canada, Dr. Verna Huffman Splane was a public health nurse and an internationally recognized health leader and champion of global health. Huffman Splane became the first woman Chief Nursing Officer in the Canadian Department of National Health and Welfare, the highest office of any nurse in the country.

This annual event is made possible through the generous support of the Mt. and Mrs. P.A. Woolworth Foundation. The event will take place at Robin Squire on a Thursday evening in November. The Afternoon Symposium is a brief panel discussion on a companion topic to the lecture.

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This year, the centenary is marked by keynote speaker and UBC Dr. Susan Duncan, Professor and Director, School of Nursing, University of Victoria.

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For as long as they could remember, many members of the Lytton First Nation in British Columbia had been wary of tap water. Even as children, they had known that if they drank it, they might get sick.

So in the summer of 2016, it was with cautious optimism that the residents of five homes in two Lytton reserves watched as a new water treatment system was installed in their basements. Could this refrigerator-sized device, developed by researchers at UBC, really give them the clean tap water they had needed for years?

When it comes to providing potable water to under-resourced communities, Canada’s track record is spotty at best. While a number of good water systems in place, the federal government considers to be too small communities that have received government funding now have had needed for years? 

For communities like Lytton First Nation, the situation may be even more challenging. With an on-reserve population of around 1,000, Lytton First Nation is largely composed of pockets of two, three or four homes — so-called “micro-communities” — that the government considers to be too small to qualify for capital infrastructure funding. Effectively left to fend for themselves, they have no choice but to buy bottled water or boil water drawn from nearby creeks or rivers in order to meet their daily drinking, washing and sanitation needs. There are thousands of them scattered across BC alone.

When Madjid Mohseni, a professor of chemical and biological engineering at UBC, first visited one of these underserved communities, he was startled by what he saw. Although a substantial portion of the world’s population has always lacked access to safe drinking water — as of 2018, it is about a quarter, or 2.1 billion people — the water conditions Mohseni observed were closer to what one might encounter in a developing nation, not a so-called developed country like Canada. And the damage, he knew, was more than physical; it was also moral — depriving people of their sense of dignity and self-worth.

“As the United Nations has declared, access to sufficient safe water is not just a human right, but essential to the realization of all human rights,” says Mohseni. “As an engineer, I feel compelled to do what I can to help address a solvable problem that has persisted for far too long.”

To this end, Mohseni has served for nearly a decade as the scientific director of RES’EAU WaterNET, a UBC-based research network which aims to develop and deliver innovative new water technologies, that are tailored to small, rural and Indigenous communities — historically neglected groups which continue to seek proper recognition. The first and only organization of its kind in Canada, the Network currently includes 17 professors from eight Canadian universities, as well as numerous partners from the public and private sectors.

But it is the partner communities that lie at the heart of RES’EAU, shaping and driving all of the work that it does. Through group and individual meetings, community members provide the network with valuable information about their needs, preferences and expectations. In doing so, they help co-create solutions that meet the unique requirements of their community.

Dubbed the “Community Circle” approach, this enables Mohseni and his colleagues to not only provide the best technology possible for that particular community, but also build trust and form lasting relationships with the residents themselves.

“RES’EAU is about respecting the cultures and lives of the end users as much as it is about research, technology and policy,” says Mohseni. “Our approach to research is to treat communities and operators as co-developers and valued partners, and they will respond by becoming the projects’ most valuable resources. More often than not, the user communities and operators provide better ideas than anything we could have come up with ourselves.”

For several months after UBC’s water treatment devices — equipped with filters and ultraviolet disinfection technology — were installed in the two Lytton First Nation reserves, local operators monitored their performance (good), energy consumption (minimal) and homeowner response (positive) on a weekly basis. And in January 2017, after the First Nations Health Authority reviewed the information that had been collected, the boil water advisories were lifted — and remain so today.

Since then, RES’EAU has installed similar point-of-entry systems, as well as centralized water treatment systems, in several other BC communities that have been under decades-long boil water advisories. As the federal government seeks to end all long-term drinking water advisories on public systems on reserve by March 2021, RES’EAU will continue working to advance its goals: creating and implementing innovative new water technologies, enhancing dialogue and collaboration among stakeholders, and improving governmental policy and regulations relating to small water systems.

“We hope that our Community Circle strategy offers a promising model for small water systems that will eventually be adopted not just across Canada, but around the world,” says Mohseni. “A cookie-cutter approach to addressing issues of this magnitude can take you only so far.”
Everyone knows what pain is. Or do they? Though we have all felt pain, we seldom think about its nature, its causes and the fact that it is all in our heads — or, more specifically, our brains.

Pain is a complex, biopsychosocial phenomenon that arises from the interaction of multiple neuroanatomic and neurochemical systems with a number of cognitive and affective processes. Put simply, pain is a response to a biological stimulus, when an internal or external stimulus presents itself to the body, a message is sent through your neurons to the spinal cord and relayed to the brain, where the brain decides whether or not the stimulus is a threat. If a threat is perceived, your brain will elicit a pain response to protect you from the harmful stimulus.

A pain response that lasts longer than 12 weeks is referred to as chronic pain — and it’s a different kind of beast. When the neurons and brain cells that produce pain are stimulated for extended periods of time, they become increasingly sensitive and less precise, producing pain in response to smaller and more nonspecific stimuli. Eventually, your body may try to protect you from a stimulus that is no longer a serious threat, or even one that no longer exists. This kind of chronic pain is very difficult for health practitioners to treat.

An estimated one in five Canadian adults suffers from chronic pain, resulting in $43-60 billion per year in health care expenditures and lost productivity. This exceeds the cost of cancer, heart disease and HIV combined. In BC, chronic pain affects approximately 800,000 people, and with the province’s aging population, this number continues to rise.

The Pain is All in Your Brain

UBC School of Nursing Drs. Bernie Garrett and Tarnia Taverner, along with Dr. Diane Gromala (Simon Fraser University), are conducting studies to support the growing body of research around the use of virtual reality (VR) as a treatment for chronic pain. 

“VR offers a powerful form of distraction, far more immersive than other forms of multimedia — where-by the user is placed in a simulated environment that looks and feels just like the real world,” says Garrett. “As VR is computer-mediated, we can totally control the experience of the user and what happens within this world. We can tailor VR environments to be specifically targeted at specific things, such as pain research.”

“Currently we’re testing the use of virtual reality in patients with chronic pain associated with cancer diagnosis and we are finding for some people it does have an effect,” says Taverner. “The best approach to chronic pain is a multi-modal approach [which may include medication, relaxation, VR or other tools and techniques], and each individual will find what is best for them.” By temporarily relieving the pain sensation, if only briefly, the therapy is in a sense pressing a reset button that with continued exposure may enable the individual to begin retraining their nervous system not to respond with pain messages.

“If you’ve had pain for years from the moment you wake up to the moment you go to bed and then suddenly you are immersed in an environment and the pain goes, that is significant,” says Taverner.

However, the researchers caution that pain relief is not as simple as plugging in to a VR headset from your local electronics store. Most VR applications available for purchase are designed for young adrenaline seekers — the top grossing VR experiences of 2017 include an incredibly violent gladiator simulator; a tactical multiplayer shooter game; a zombie apocalypse and a sci-fi futuristic technothriller — and are completely unsuitable for cancer patients: “You don’t want anything that will induce fear or raise anxiety levels,” says Garrett.

With that in mind, four distinct VR experiences were custom-designed for their study: one is a virtual meditative walk through a forest, in another you are an eagle flying over a beautiful island, another involves a problem solving puzzle game and the fourth involves a desert island quest. All have been designed to employ a level of fidelity that ensures the patients feel sufficiently immersed in the experience.

“From previous work, we determined that we needed applications in two basic categories: mindfulness-focused introspective activity and cognitive stimulation,” says Garrett. “While many patients really benefited from relaxation of meditation, others found that it actually made their pain worse because it took all other stimuli away and all they could focus on was the pain.”

Chronic pain can take many forms and individual responses to pain cannot be predicted. “Chronic pain in cancer patients may result from the actual development of the cancer, from the treatment or even nerve damage following successful treatment. And pathophysiology doesn’t necessarily correlate to degree of pain,” explains Garrett. “You’d think that the people with the worst pathophysiology would have the worst pain, but that’s not always true. This really speaks to the fact that there is a neurophysiological element to the experience of pain.”

For 30 minutes a day over four weeks, the researchers measure pain relief resulting from all four of the custom experiences. And with more than 60 participants completed thus far, they can say with certainty that there are some immediate benefits. While in the VR environment, participants report varying degrees of pain relief. While this in itself is significant, the fact that for some patients this relief has lasted up to 30 minutes after the session ends is indicative of an extended neurological impact. Although the statistical analyses are not complete, the researchers are keen to find out whether a patient’s overall experience of pain was reduced as a result of repeated exposure to the VR — this would have significant implications for the treatment of chronic pain.

Currently, magnetic resonance imaging (MRI) is the only way to effectively analyze the neurological effects of VR treatment, but you can’t put a VR headset inside a giant magnet. However, in early 2019, the study will install an electrical encephalography (EEG) component that will provide information about the patients’ brain waves — potentially adding to existing research that suggests that brain wave modification can occur with certain meditation and mindfulness techniques.

For more information on this study, or to participate, visit: tiny.cc/VRforCancerPain.
In his short-lived blog Pancratic Times, Kevin Watson documented his struggles with cancer — his dance, he called it. On March 15, 2012 he shared his distaste for chalky tinctures, syrups, sticky energy gels. “I’ve been pretty clear that I don’t want people feeling sorry for me,” he wrote, “but given these remedies, I am asking you now.”

The blog, however, soon became difficult to write. On May 5, the 43-year-old apologized for his “lack of energy and creativity.” Five days later the father of two died at home while holding his wife Christi’s hand. His last blog entry reads, “Au revoir but not goodbye.”

Shortly after his passing, Pedal magazine ran an obituary and image of Kevin racing at a Toronto cycling competition. After all, Kevin’s life had many directions: besides being a father and competitive cyclist, he worked as a creative director at Shaw Media, determining the “look and feel” of History Canada and other specialty channels. “Kevin was self-admittedly a happy, fulfilled guy in every way,” says his father, Colin Watson.

While Kevin grew up in Toronto, the city of Vancouver loomed large in his early life. In the early 1990s, he attended UBC with his brother, riding his cyclocross bike through the thick-necked cedar trees around campus. No doubt Kevin often passed Acadia Creek — the unassuming stream that, decades later, and after his death, his family would restore in his name.

Of the over 100 streams in Vancouver that once bore salmon, only three are left: Musqueam, Spanish and Stanley Park’s Beaver Creek. Four streams, actually, if you count the one alternately called Salish by the Musqueam First Nation, Acadia or Hillary Creek by Google — and Unnamed Creek by Metro Vancouver. And while a city report designated Salish or Unnamed Creek as “one of the last, seemingly healthy streams in the area,” that bill of health was revoked in 1947 with the introduction of a culvert.
Few biologists assumed coho salmon could ever wriggle through the barrier, let alone spawn upstream. In 2011, however, Streamkeepers—a creek restoration group—captured some revealing video: an adult coho attempting to flip into the colos-sal culvert. Although the fish presumably gave up without spawning, the video was shared among fisheries folks associated with Streamkeepers and the Department of Fisheries and Oceans (DFO). “That raised awareness,” says Robyn Worcester, biologist with Metro Vancouver. “Wild coho salmon were actually using the stream.”

After Kevin’s passing, Colin and Barbara Watson decide that UBC needed some attention from us. Passions of children can often be sourced back to their parents, and Colin Watson, too, loved the outdoors and had attended UBC. A former CEO of Rogers Cable Systems—and subsequent-ly Spar Aerospace—Colin had grown up in Vancouver, a childhood spent many weekends at the gossamer end of a fishing reel, casting into Capilano River and the high-rising Lynn Canyon. To this day Colin flies to New Brunswick to catch-and-release Atlantic salmon on the renowned Restigouche River.

Although other options for their UBC donation emerged, it was Kevin’s connection to landscape that prompted his parents to fund the Salish Creek restoration. “If he were alive today,” Colin says, “Kevin would have thought it a dandy way to spend $250,000 of family money.”

The six-year project would involve so many partners and government jurisdictions that it almost emulated the layering and complexity of nature itself. How complex? The federal government oversees the tidal waters and creek itself, while the province protects the streambanks and land sur-rounding it. The drainage, meanwhile, winds through UBC Endowment Lands and Metro Vancouver manages Pacific Spirit Park, through which the lower creek becomes Burrard Inlet. And the Musqueam history runs under it all, having the longest stake in their unceded land. Just one century ago the peninsula was a diverse, thriving ecosystem.

The reestablishing of this creek has not only significance to Musqueam people and for the long-term benefits to our wild salmon,” says Morgan Guerin, a Musqueam First Nation fisheries officer, “but also the identity of the area involved. With the cooperation of UBC and Metro Vancouver and the respect they have endeavoured to show Musqueam, this project is breathing life into this place that is well within our historical memory. Rather than ‘Here is something we used to own,’ we can say instead, ‘Here is something we belong to.’”

Yet the restoration would be slow. It would involve many government permits and stakeholder meetings, not to mention the cycles of provincial, federal and municipal sign-off. And as the project partners all understand, when humans attempt to revise nature, nature often resists, recon-figuring these efforts in unexpected ways.

After the Streamkeepers video was cap-tured in 2011, engineers added baffles to the culvert. Little ledges designed to interrupt and slow the current and allow spawning coho to ambitiously and lever them-selves upstream. But, in 2017 the project leaders discovered these weren’t enough to facilitate spawning.

“The fish couldn’t access the culvert,” says Barry Chilibeck, principal engineer at Northwest Hydraulic Consultants (NHC), the company contracted by UBC to carry out the engineering portion of the project in partnership with Ken Ashley, director of the River’s Institute at BCIT. “The drop was too great, with the pool water too low.”

A healthy stream runs in a classic pool/rif-flie sequence, but Unnamed Creek had few ripples or pools. “This was impacted habitat,” Chilibeck says, “so we connected the creek to the ocean, restructuring the channel to make it more natural and complex.” NHC strategically arranged rocks to create riffles—adding oxygen as water bumbles over them—and log sills to fashion sandy pools in which salmon could spawn and hide from predators. Yet the area was still scrubbed with English Ivy: an invasive spe-cies that should out indigenous plants, many of which provide habitat for salmon and other animal and plant species.

Then, in September 2017, the project lead-ers found something unexpected. As an archaeological impact assessment was being conducted to ensure that the rees-tablishment of Salish Creek wouldn’t disrupt the cultural heritage of the Musqueam, the diggers unearthed what looked like human bones. The ICMP were immedi-ately called.

“The bones were human and archaeo-logical in origin,” as Greg Morrissey, the project manager of Kleenaa Consulting, wrote in an email thread to other proj-ect members. “These remains will be handled, stored and reburied following protocols by the Musqueam.”

Another complication arose that spring, when a flood flushed the drainage, imme-diately the team grew concerned about displaced sills and rocks. The spring flood, DFO quickly ascertained, had fortunately spared their riffles and pools. Once again, the project was on, though it was four years along now, in part because the timing of this multi-partnered, collective effort had to follow the increasingly unexpected rhythms of the seasons.

“I admit I tried to talk Colin into moving to other projects,” says Don Mavinic, the UBC civil engineering professor who acted as principal investigator of the restoration. “But he had perseverance. He said, ‘I would rather have it happen here, because this is where my son went to school.’”

Since then, DFO has detected the occa-sional scurrying of salmon fry in the creek. While the fish, Robyn says, may not have originated from a “spawner,” it’s too early to determine whether salmon are actually returning to Salish, only time can reestab-lish the population. “Improvements to the creek,” Robyn adds, “have made it a more functional ecosystem. We are seeing contributions to other spe-cies as a result of the habitat restoration.”

On a recent visit to Salish Creek, Mavinic (now retired) noticed a school of cut-throat trout winnowing across the creek mouth. Unlike salmon, trout are plentiful here. “And I didn’t have my fly rod,” he joked. Three small salmon also appeared, inscribed with the tell-tale markings of a coho. “I would recognize their spots anywhere,” he says. “The fish were meandering upstream past boulders and logs and ‘to this day’ I don’t know if they thawed or not. I never know because I had to return to class.”
They have endured torture and starvation; witnessed the abduction and murder of family and friends; watched as their houses were looted and burned to the ground; been forced to flee their homelands, perhaps forever. But for many refugees, one nightmare has only meant beginning another: life in a refugee camp, where danger and disease continue to lurk around every corner. Indeed, they are places where even a simple visit to the toilet can be fraught with indignity and fear.

Each day, unaccompanied women, adolescents and children are faced with a grim dilemma: either relieve yourself at a remote communal pit latrine while it is still light, when you will likely be in full view of strangers, or else try your luck after dark, when you may become a victim of sexual violence. A third option is to stay at home and potentially contaminate the space where you and others live.

Thanks to an innovative new technology developed by students at UBC, however, refugees may soon be able to go to the washroom in the relative safety of their homes. Called the MYCOMmunity toilet, the device not only processes human biological waste without water, plumbing or electricity, but also is portable, low-cost and scalable — making it ideal for use in under-resourced communities like refugee camps.

Existing portable or composting toilets are too expensive, unwieldy or environmentally unfriendly to serve the needs of their communities. “At first we envisioned our toilet being used at outdoor concerts, camping grounds, places like that,” says Patrick Wilkie, a graduate of UBC’s Department of Electrical and Computer Engineering. “But we soon realized that it could have a much bigger positive impact in refugee camps and other underserved environments, where proper hygiene, sanitation and personal security systems aren’t usually available.”

Made almost entirely from live mycelium, or the fibrous part of mushrooms, the MYCOMmunity toilet collects urine and fecal matter in separate tanks before treating them with different microbe/enzyme/mineral blends: magnesium and urease for the urine, a designer mix of bacteria for the feces. These blends transform the waste into fertilizers, and when the toilet is full (after around 30 days for a family of six), the entire unit can simply be placed in the ground, where it will decompose and provide nourishment for crops, grasses and trees.

Formed to participate in the 2018 Biodesign Challenge in New York City, the UBC group spent five months designing and building a half-scale prototype of the technology for the event. And despite the stiff competition — 100 university teams from around the world participated — they ended up taking first place overall, having impressed a judging panel full of design-world luminaries with both their technology and a presentation of their work. The toilet was subsequently displayed for several days at the Parsons School of Design’s Making Center.

“This is another example of the immense value of interdisciplinary collaboration,” says Joseph Dahmen, a professor in UBC’s School of Architecture and Landscape Architecture, who led the team together with Steven Hallam, a UBC professor of microbiology and immunology. “Architecture, engineering, forestry, land and food systems, microbiology, immunology — all were represented by the group members, who probably wouldn’t have been able to achieve what they did without everyone’s unique perspectives and contributions.”

The Biodesign Challenge team was supported by the Peter Wall Institute for Advanced Studies, where Dahmen and Hallam were both Scholars in Residence, and by the Ecosystem Services, Commercialization Platforms and Entrepreneurship (ECOSCOPE) Natural Sciences and Engineering Research Council of Canada Collaborative Research and Training Experience Industrial stream training program, in which many of the UBC team members are involved.

The team is currently working on a full-scale, optimized version of their device, which will be tested at campsites and music festivals. Easily assembled, installed and maintained — and expected to cost under $20 — the technology has a strong potential to improve the health and safety of the approximately 2.5 billion people around the world who lack safe access to proper sanitation.
NEW FACULTY

The Faculty of Applied Science attracts top faculty from around the world — innovative researchers, empowering educators, industry leaders and award winning experts in their fields. Each new faculty member grows our network and strengthens our position as a global leader in research and teaching. They all bring something unique to the Faculty, and we are proud to now count them among our own.

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Save the Date: Design and Innovation Day will take place in April 2019 at UBC. This exciting interdisciplinary event will showcase capstone projects, design and research initiatives, and activities undertaken by students from Engineering, Architecture and Landscape Architecture, Community and Regional Planning, and Nursing.

Connect with top talent and promote career opportunities at your company. Experience interactive presentations and hands-on demonstrations.

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Vancouver
Alumni and students congregated at the Engineering Student Centre, reuniting with old friends and making new ones. We mingled, laughed and even had the opportunity to chat with James Olson, the dean of UBC Applied Science. And let’s not forget the food sizzling on the grill.

The first ever UBC Applied Science Homecoming BBQ — hosted by Dean James Olson, and held on September 22 — saw alumni from all four APSC schools (Architecture and Landscape Architecture, Community and Regional Planning, Engineering and Nursing) celebrate their alma mater. Not long after Dean Olson gave a speech in which he thanked alumni for their support, everyone paraded down to Thunderbird Stadium, where more alumni and students gathered, enlivening the bleachers. While the T-birds lost, we made it a victory by cheering them on. We can’t wait to see you all next year!

Kelowna
UBC Okanagan also held its inaugural Homecoming, on October 19 and 20. The School of Engineering began the festivities on Friday with an industry night that featured alumni, current students, faculty and industry partners. The evening’s keynote speaker was alumni UBC chair, Randall Findlay.

Saturday’s Engineering Extravaganza included a number of highlights, one of the most popular being “Dunk the Dean” (a United Way dunk tank fundraiser featuring Dean James Olson and Associate Dean Rehan Sadiq), a catapult construction zone and bouncy castles for all ages. A food truck festival kept everyone well fed.

Homecoming wrapped up with a scavenger hunt hosted by Amazing Race Canada host and Olympic gold-medallist, Jon Montgomery, Nourish (a local harvest festival) and a USports men’s soccer match featuring the UBC Okanagan Heat and the Thunderbirds.

If you would like to become actively involved in our alumni opportunities, but missed these inaugural homecoming events, there are many more in the coming year! Visit us online at apsc.ubc.ca/alumni to find out how to connect.
ALUMNI HIGHLIGHTS

BACHELOR OF SCIENCE IN NURSING CLASS OF 1958 – 60TH REUNION
May 2018

An historic event took place at the UBC School of Nursing in May 2018 when the students in the current cohort met with graduates of the class of 1958. As part of their 60th reunion celebration (planned to coincide with the 2018 UBC Nursing Celebration Gala), the alumni attended an event to connect with the current class of students to share their experiences of being nursing students in the 1950s and to hear about the student experiences of 2018. Without hesitation, 25 students signed up, one of whom remarked that this was a once-in-a-lifetime opportunity they didn’t want to miss. Some of the graduates remarked that this event was one of the highlights of their reunion and were pleased by how articulate and mature today’s students seemed. The students agreed that it was a positive experience that they would never forget and recommended that this type of event be repeated. The Class of 1958 then attended the UBC School of Nursing in May 2018 when the students in the current class consisted of one doctorate, 12 master’s and 33 bachelor’s degrees. Now 50 years later, the 2018 class consists of 21 master’s and 115 bachelor’s degrees.

CIVIL ENGINEERING CLASS OF 1988 – 30TH REUNION
July 10-11, 2018

The reunion took place on the UBC Vancouver campus during the 2018 Homecoming weekend. It was a delight to see a total of 14 classmates, along with a few guests who were in attendance to celebrate our 30th anniversary. In the morning, we gathered in the foyer of the Chemical and Biological Engineering (CBE) building and shared our experiences in our careers and personal lives. Professors Brunson, Epstein, Meisen and Watkinson, who had taught the class, joined us during the Dean’s Homecoming BBQ, which was held at the Engineering Student Centre. It was amazing to all of us that Professor Epstein, well into his nineties, continues to work every day.

MECHANICAL ENGINEERING CLASS OF 1968 – 50TH REUNION
September 14-15, 2018

The reunion was an amazing success and over 30 alumni travelled from Singapore, Hong Kong, Connecticut, Texas, Oregon and all over Canada to celebrate. Pub night, on May 18 at Blencroft (in Wesbrook at UBC), had many marvelling at how much campus had changed. On May 19, we were treated to a building and lab tour by Marline Chow and special remarks by department head Dr. Peter Eigenzoss. Saturday afternoon required an impromptu reuniting of the class by Rob Darling and Jillian Cooke to return to the Class of 1959 icon that had been painted on early that month. A banquet in the Engineering Student Centre that evening was enjoyed by classmates, family, faculty and department staff. Heidi Yang and Su-In Khain presented English with a cheque for $10,000 to support future third-year field trips – fondly remembered by many. Paul Hurst and Ray Jelly MC’d a hilarious “then and now” slide show comparing grad photos, and sharing career, travel and family info about each graduate. A live band was made to a coffee gathering the next morning at Granville Island.

Mechanical Engineering of 1968, 2018 & 2023 - The Class of 1968 marks 50 years since its origins, and particularly since 1958. It is a special group of alumni because most of the old farts in the room realized that with current academic admission thresholds they’d never make it into today’s program! The event concluded with the remembrance of “Joe’s Angels” — our EUS ’78 Executive. Despite his earlier protestations of stage fright, a great impromptu speech was delivered by EUS ’78 President Joe Uyessog (including trademark borderline non-PC comments) who made a special journey from California for the occasion.

Organizing committee: Bart Szeliske, Fred Dunnert, Larry Surrao, Doug Dean

UBC Engineers Club 1958 - 60th Reunion
September 19, 2018

Fifty-eight alumni, family and friends celebrated the occasion. We gathered for a wonderful luncheon at Shaugnessy Restaurant, on Varsavsky Drive. Registration began at 11 am and within minutes, the noise of happy reunions filled the restaurant. Alumni came mostly from the Lower Mainland; however, Nenda and Rob Roger (ENPH) came from Australia, Sig Saimetti (ENPH) from Kingston, Ontario, and Margaret and Rod Keich (MECH) flew in from Indiana. Others flew in from many parts of BC. Guests of honour were retired Professors Norman Epstein and John Lund. The guest speaker was Joe Stott, retired director of UBC Campus Planning, who illustrated the many changes to the campus since its origins, and particularly since 1958.

The organizing committee included: Craig Clack (CHEM), Bob Dolphy (ELEC), Don Cowan, Ed Fraser (SHAR) and Fred Szeckau (campus liaison) (ELEC); Zelena Moore (EMPH); Tom Fawcett (Treasurer); Russ Fraser and Don Shewchuk (MECH); Don Gunning (memorialist) (WEL). The committee has met annually for the past 10 years to organize a reunion lunch at the West Vancouver Yacht Club. This year, being our 60th, we opted for a fancier setting, just before Homecoming.

We look forward to seeing our colleagues at UVic for our 60th reunion lunch in September 2019.

Submitted by Ed Fraser, ELEC ’58
INGENUITY ASKS...

Q&A: Mona Lovgreen

Mona Lovgreen [BEnD ’05, MArch ’10] is a senior project architect and associate focused on comprehensive planning and mixed-use developments at DIALOG — an integrated design firm with offices in both Canada and the US, whose multi-disciplinary team includes architects, urban planners, interior designers, structural, mechanical and electrical engineers, and landscape architects — in San Francisco.

How would you describe the perfect space?
The perfect space is a space that elevates your senses and enhances your life’s quality, for a moment, a day or a lifetime.

What is the riskiest thing you’ve done?
Leaving a certain career path in an established studio in Vancouver and moving to San Francisco to build up a brand-new studio for my firm and grow the business in an unknown market without any prior business development experience.

What is the most interesting building you’ve ever visited?
The World Trade Center Oculus by Santiago Calatrava.

What career success are you most proud of?
That is yet to come. I hope!

What’s the most difficult thing about beginning a new design project?
Starting a new design exercise can always be very scary. There is that unknown element and the challenge of staying open and vulnerable to endless possibilities and allowing the design process to guide you.

What is the personal trait you wish your career had better made use of?
Entrepreneurism.

If you had a motto, one that followed your name everywhere it went, what would that motto be?
Set goals that challenge me. Achieve them. Start anew.
BE A LEADER IN YOUR FIELD
ADVANCE YOUR CAREER

Why choose? Get the business management, leadership and enhanced technical skills you need to progress.

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NAVAL ARCHITECTURE AND MARINE ENGINEERING
URBAN SYSTEMS
CLINICAL EDUCATION
SENIORS CARE