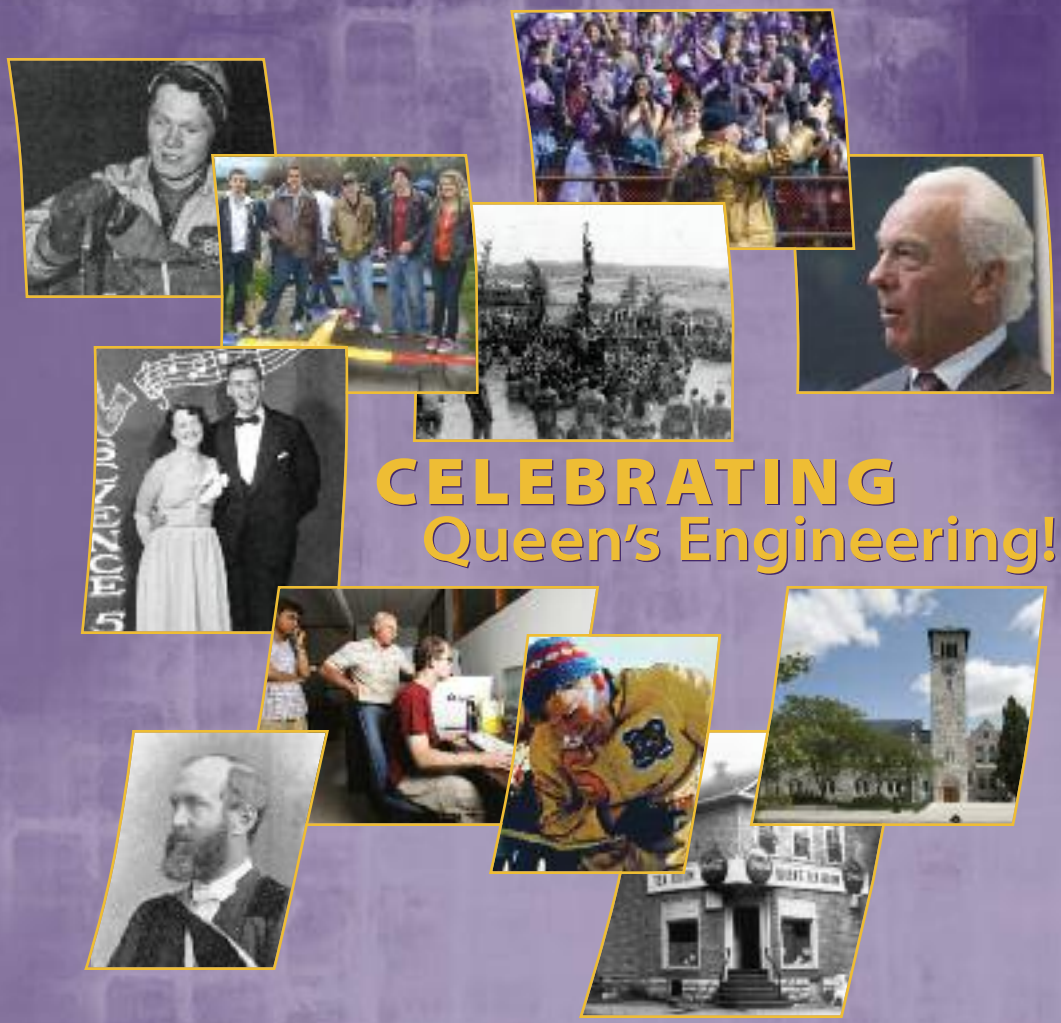
WINTER 2011

THE COMPLETE ENGINEER

THE MAGAZINE OF THE FACULTY OF ENGINEERING AND APPLIED SCIENCE AT QUEEN'S UNIVERSITY

Queen's University



CELEBRATING Queen's Engineering!

INSIDE...

Celebrating Queen's Engineers: Ten profiles of Engineering Alumni

Principal Daniel Woolf reflects on the legacy of Queen's engineering

Queen's Formula SAE Team roars to its best season ever

A special, four page, **PULLOUT** history and timeline of the Faculty

RETURN UNDELIVERABLE CANADIAN ADDRESSES TO:
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WINTER 2011

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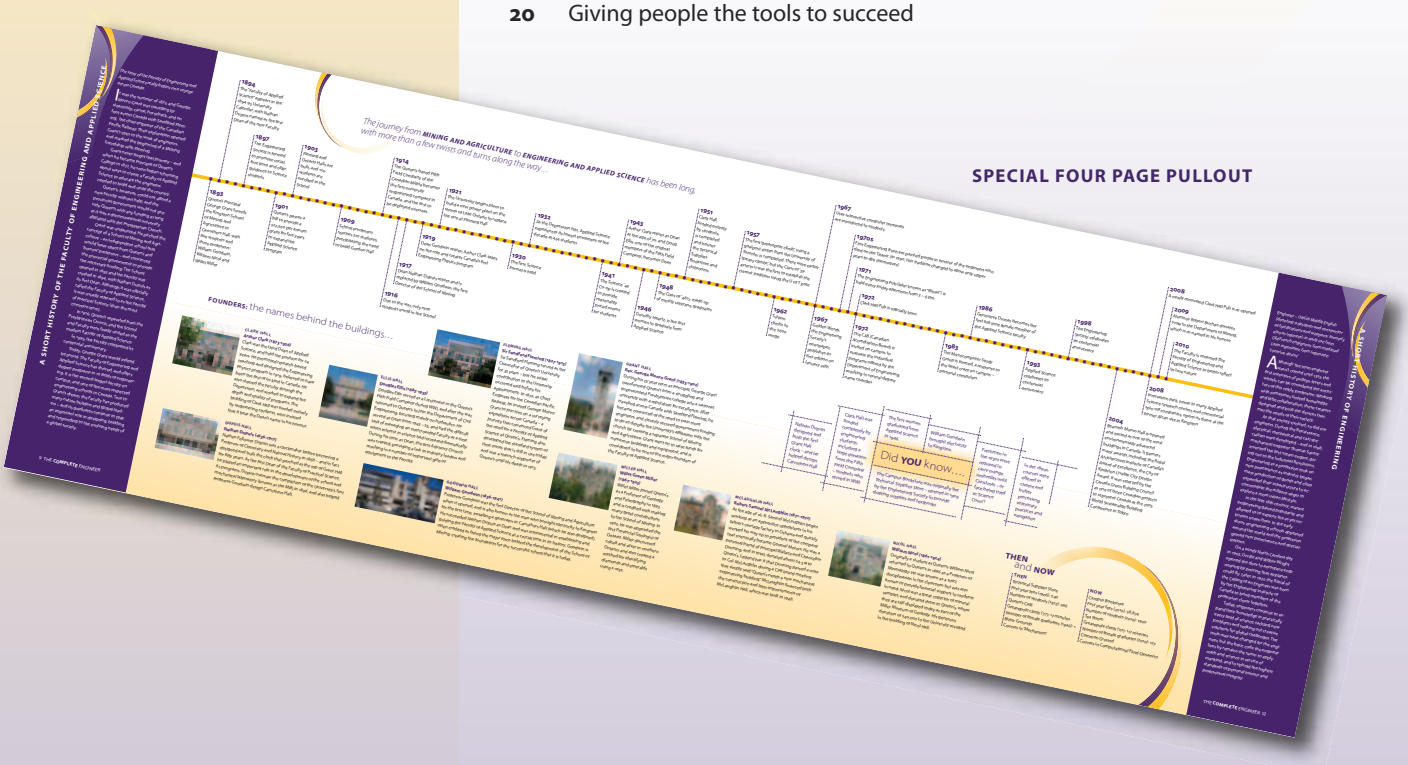


SPECIAL FOUR PAGE PULLOUT

A TIME TO celebrate

Welcome to the Winter 2011 issue of *The Complete Engineer.* This issue is a celebration.

We are celebrating our past.
You will find a special four-page pullout that illustrates our Faculty's history and features a handy timeline detailing our evolution. Also in this issue, a Q and A with Principal Woolf describes the role our Faculty has played at Queen's University and the future he sees for us.

We are celebrating our present.
We profile ten of our alumni. These are men and women who have been shaped by their experience at Queen's and in turn are shaping the world around them. We also profile the research of Dr. Tim Bryant, a professor in our Department of Mechanical and Materials Engineering, whose work on an improved, affordable prosthetic foot is helping people in the developing world who have lost lower limbs due to landmines and natural disasters.

We are celebrating our future.
Read about our students, their activities, their initiatives and their accomplishments.

We are celebrating Queen's Engineering and Queen's Engineers, and there is much to celebrate.
I would like to take this opportunity to thank the faculty members, department heads, staff and students of the Faculty of Engineering and Applied Science. It has been a challenging and exciting three years and, with the support of this great group of people, we have accomplished much. I would like to highlight a few of the key developments.

We have:
- Completed our strategic and academic plans
- Welcomed ten new faculty members
- Started two new degrees at the graduate level
- Received one of the largest single donations to Queen's University
- Produced new recruitment materials, new websites, and videos
- Welcomed 150 more undergraduates students a year
- Increased our international undergraduate enrollment by 8.6%
- Been awarded over $60 million in research funding including a $17 million Canada Foundation for Innovation grant and $5.8 million in Ontario Research Funding
- Established three new research chairs

Further:
- Our professors have won three Premier's Excellence awards
- Our incoming average has increased by 2%
- Our 2010 incoming class was 28% women, the highest percentage of any Faculty that offers programs from across all disciplines
- Our professors have won over 30 teaching awards
- Our design teams have done extraordinarily well! In 2010: • **Queen's Space Engineering Team** placed sixth at the annual CanSat challenge in Amarillo Texas • **Queen's Formula SAE Team** was the top Canadian team, finishing 16th out of 120 teams, at the Michigan International Speedway. This represents the team's best result in its 17-year history • **Queen's Baja SAE Team** placed seventh overall in Design Judging at Baja SAE Carolina, and received second place for their Design Report • **Queen's Mostly Autonomous Sailboat Team** placed third in the Sailbot class at the World Robotic Sailing Championship • **Queen's Aero Design Team** placed 18th out of 29 teams in the SAE 2010 Aero Design West competition in Los Angeles, California
- We have a new Aboriginal Access program to support enrollment of Aboriginal students in engineering
- AND we have a new name, The Faculty of Engineering and Applied Science

BERNARD CLARK

As you can see, we are in the midst of much change. Change can be challenging, but it also brings new and exciting opportunities. We've been pleased to welcome back many visiting alumni recently, and I encourage you to come visit as well – come and share in our excitement.

I wish you all a safe and prosperous 2011.

Kimberly A. Woodhouse
PhD, PEng, FCAE, FBSE
Dean, Faculty of Engineering
and Applied Science

Q and A with Principal Daniel Woolf

Q You received your Bachelor of Arts from Queen's in 1980. Do you recall your initial impressions of the Engineering Faculty and its students? How were they unique?

I had pretty early contact with engineering students. Quite literally the first two people I met at Queen's when I arrived at Brockington House to check in were two Science '79 engineers, Charlie Lund and Michael Campbell. I'm still in touch with both and the latter was a housemate on Alfred and then Frontenac Street. I was struck by the enormous camaraderie and spirit among engineers, even by normally high Queen's standards, and also by the exceptional rigour of their courses. The workload was legendary (though I suppose mine in Arts was just as heavy, just differently distributed).

Q The Faculty of Engineering and Applied Science has played an important, often pivotal, role in Queen's history with its faculty and alumni making invaluable contributions – men like George Grant, James Douglas, Douglas Ellis, and Hugh Conn, to name but a few. Do any of their stories particularly resonate with you?

I've spent some time poring over the two volumes of Queen's history published so far and also read up on the Faculty's more recent history. What's clear is that while engineering has been a relatively late addition to some other universities, it has been a core part of Queen's from nearly the beginning. I think the early founders and teachers, people like Nathan Dupuis, had a vision of a program which, while "applied," also offered a very broad-based curriculum. It's not surprising that many of our engineering grads have acquired transferable skills that have seen them succeed in other spheres, for instance in the financial services sector. We should note some recent successes – notably Julie Lassonde, who addressed spring Convocation. Faculty graduates are creating a distinguished record for the future.

QUEEN'S MARKETING AND COMMUNICATIONS

Q These are challenging times for the University, but we have seen challenging times before. What lessons can we take from the past to help us now?

As a historian, I would note that the past does offer us some lessons, including the fact that we've been in difficulties before – in the 1860s and again in the 1920s and 30s. The Queen's name and reputation has emerged stronger, if different, every time. Personally, I'm extremely bullish about Queen's. All universities are facing stress; there is no question these are challenging times, particularly with government deficits, significant restraints on our revenue sources, and other public policy areas, notably health, crowding out higher education. The appointment of one of my fellow university leaders, Queen's grad David Johnston, as our next governor-general, is a very positive step in terms of the profile of postsecondary education. With regard to the particular challenges facing Queen's, we have huge human capital upon which we can draw among our students, faculty, staff and alumni.

Q Traditions are very dear to the hearts of Queen's engineers, as they are to all Queen's alumni. This is a source of great strength and pride. How do you balance a respect for the University's past and its traditions with the need to move forward and evolve?

Again, one of the lessons we should take from the past is that we shouldn't be imprisoned within it. We are justifiably proud of our traditions. The legacy of Queen's engineers and their "Renowned Spirit and Unrivaled Excellence" is a core part of the Queen's experience, and that will never change. But as I noted nearly a year ago in my installation address, tradition is all about cumulative change; it's not about preserving everything that we have indefinitely. George Grant would not recognize the university of today, just as our first Principal, Thomas Liddell, wouldn't have recognized the university of Principal Grant's time. We should preserve those things that are

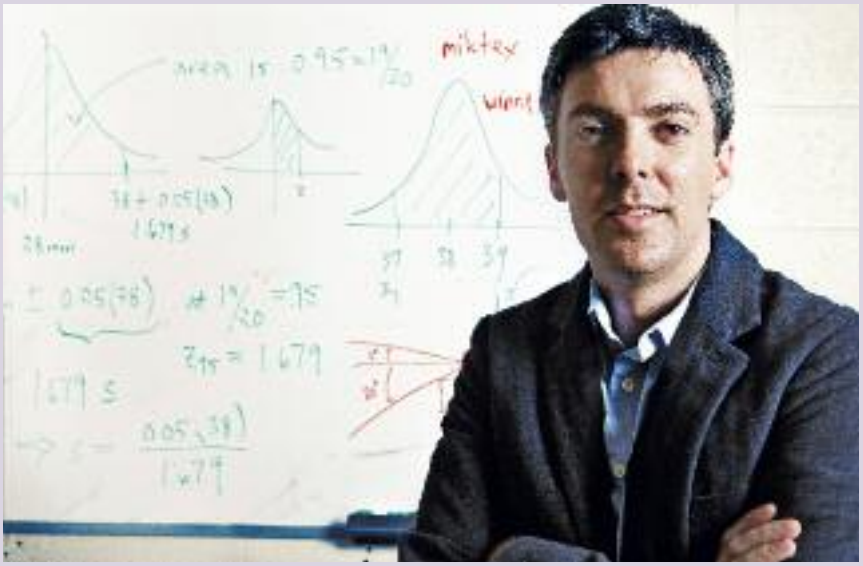
absolutely core to our identity and mission as a national trust for teaching and research, and we should be carefully selective about new ventures, rather than galloping off in every direction. Some things probably do need to be set aside because, though we are comfortable doing them, they may not meet the needs of 21st-century students. The ongoing academic planning process will help us determine our future path.

Q What role do you see the Faculty of Engineering and Applied Science playing in the University's future?

Engineers have a "let's solve it" approach to problems and this is needed right now at Queen's and in the world. Engineering grads have also been among our most generous donors, people like Alfred Bader and Robert Buchan. All levels of government have talked about the need for more 'highly qualified persons' in Canada, and Queen's Engineering and Applied Science alumni (from both our undergrad and postgraduate programs) perfectly fit this need. The broadly interdisciplinary approach the Faculty has taken over the years, including the common first year, provide examples of innovation that other Faculties may borrow from, as appropriate. I'm looking forward to working with Dean Woodhouse and her team on continuing to promote the Faculty and its interests.

WELCOME: 2 new faculty

Joshua Marshall, The Robert M. Buchan Department of Mining



QUEEN'S MARKETING AND COMMUNICATIONS

Dominik Barz, Chemical Engineering

ADAM WALKER

Putting a better foot FORWARD

QUEEN'S MARKETING AND COMMUNICATIONS

Tim Bryant, Sc'75 Mechanical, MSc'77 Mechanical, Doctorate'80

Hundreds of thousands of people the world over have lost feet because of disease, car or workplace accidents or land mines. Fortunately, artificial, or prosthetic feet are available for them, but they are often too expensive for amputees in developing countries.

Dr. Tim Bryant is working to change that situation. A Queen's professor of mechanical engineering, Bryant is the scientific lead of a global research team that is developing innovative and affordable prosthetic foot.

The need is certainly there. Conventional prosthetic feet tend to be stiff, uncomfortable to wear, and may break down within weeks or months. There are a variety of different types, such as high-tech models containing carbon fibre, but, though durable and comfortable, they cost thousands of dollars. That obviously eliminates them as an option for those with few or no financial resources – a category which, unfortunately, includes the vast majority of people in developing countries who require prosthetic feet.

Visually, Bryant's plastic prosthetic only vaguely resembles a human foot. The bulk of the plastic is in the ankle and heel area, in which is embedded a threaded screw hole that allows the foot to be attached at end of the limb. Protruding from that section is the keel, a thin, gently convex plastic plate – think of a miniature beaver tail – joined to the ankle section in a way that gives the foot some spring.

Since 1998, the team has been developing and refining a prosthesis originally designed for use in flat areas in rural Thailand; the device is now successfully used in many areas worldwide. Today, in collaboration with the Universidad Don Bosco in El Salvador, the design team – a partnership that includes Rob Gabourie, a professional prosthetist from Niagara Prosthetics International; DuPont Canada; Centennial Plastic Mfg. Inc. and Queen's Chemical Engineering student Laura Towsley – is field-testing a new version of the mechanical foot that is size-adjustable, more comfortable and suitable for use in hilly terrain.

"The wearer needs enough of a bounce to help them climb hills, but not so much of a bounce that it makes it hard for them to come down hills," says Bryant. "Finding that balance is the big design challenge. You have to be responsive to the needs set of the users."

The prosthetic itself is not meant to make direct contact with the ground, but to fit inside a shoe. To do that, users slip a "cosmesis" – a urethane foam cover that is custom-shaped to a fit user's shoe size – over the prosthesis. Together, the two items enable an amputee to become mobile and, to a casual observer, look the same as anyone else.

Best of all for potential users in developing countries, the new foot costs a fraction of its conventional counterpart, which is good news for hundreds of thousands of people in countries like Haiti and El Salvador who have lost lower limbs to natural disasters and land mines.

"It's great to see how eager people have been to support the project," says Dr. Bryant, a Parry Sound, Ontario native whose entire academic career, from undergraduate student to faculty member – has been spent at Queen's. "Everyone seems to be willing to contribute financially or in-kind because of our target population."

Queen's Formula SAE team delivers best season ever

The Queen's Formula SAE Design and Race team is on a roll.

The team, comprised of engineering students who each year design and build a one-person race car from scratch, is celebrating its most successful season in international competition since the team's inception 17 years ago.

In a competition in Michigan this past spring, the Queen's squad placed 16th overall out of a 120-team field, making it the top Canadian school. Thanks to a huge sponsorship push, the team participated in a second competition for the first time in its history. The members travelled to England's legendary Silverstone Circuit, where they placed 26th overall out of 100 teams, making them the top-ranked North American entrant.

"At Silverstone we were on pace for a top-ten finish, but a tiny engine issue caused the car to retire just two laps from the finish," says the 2011 team's project manager, Curtis Hogan. "We know we deserved to finish, and we're extremely proud of our team."

Hogan, a third-year mechanical engineering student, credits this year's unprecedented success to the efforts of a close-knit team that pulled consecutive 80-hour work weeks – this, on top of academic work – to create a car that was lighter, more responsive and easier to drive than previous models.

QUEEN'S MARKETING AND COMMUNICATIONS

Working on the car

On the track

The building of the Formula SAE car – SAE stands for the Society of Automotive Engineers, the organization that sponsors the competitions – is one of the most remarkable student projects at Queen's. Students computer-design many of the car's components, fabricate the parts using equipment in McLaughlin Hall's machine shop and painstakingly weld, screw and bolt everything together into a sophisticated high-performance vehicle that, from a standstill, can reach a hundred kilometers an hour in three seconds flat.

The goal is to engineer a car that, in the annual Formula SAE student competitions, will be judged by auto-industry experts on criteria including design, cost, manufacturability, on-track cornering speed, acceleration and fuel economy. The students must be able to present a business case for a large production run of their vehicle, which means they must apply marketing and business skills to sell mock investors on their "company". A 25-kilometre endurance race is the ultimate test of the car's performance and reliability, and success in this event clinched the top finish for the Queen's squad in Michigan.

The team members are also responsible for raising sponsorship money through marketing and promotional activities, creating and managing a budget, communicating with sponsors and faculty, and mentoring lower-year students on the team in order to perpetuate its existence after the experienced senior members graduate and leave Queen's.

The 2010 team was made possible by support from 34 sponsors, corporate and otherwise, including the Faculty of Engineering and Applied Science, the Department of Mechanical and Materials Engineering, Honda, Vale, Shell, Bombardier, Iscar and the Queen's Science Class of '62.

"Team members are exposed to advanced skills that most students don't have the opportunity to learn. Second-year students are doing everything from FEA and CFD simulation, to operating an engine dynamometer and running the CNC mills and lathes in the machine shop," says Hogan. "The team really opens your eyes to what's out there… the learning we experience is incredible."

With no fourth-year members on the team this year, the team will face many challenges, but its members are hopeful for a successful season. Says Hogan: "We're a young team, but we're extremely dedicated and our future looks bright."

CELEBRATING OUR ENGINEERING ALUMNI

Our alumni are leaders, entrepreneurs, trailblazers and pioneers: men and women who are shaping the world around them. In whatever they do, our Engineering alumni take with them the common experience that they shared at Queen's – an experience that many credit with laying the foundations for their future success.

Here are just a few of their stories.

LEADING the way

As an engineer, Merv Dewasha always ensures that the structures he designs are well-built and long-lasting. As an Aboriginal person, he works equally hard to give young First Nations men and women from across Canada an opportunity to forge a life in science and engineering as rewarding as his own.

Dewasha grew up in the 1950s on the tiny Wahta Mohawk Territory near Orillia, Ontario, but unlike many of his peers, didn't attend school there. His father worked on the railroad and needed quicker access to the train lines than the reserve could provide, so from November to April his family moved to nearby Bala, where Merv attended a two-room village school. He excelled in science and math and was always at the head of his class.

After high school Dewasha enrolled in the engineering program at Queen's and became one of the few Aboriginal students on campus. His mere presence made him a pioneer. It was only in 1960 that the Canadian government had altered longstanding legislation to allow "Indians" to attend university to pursue careers as doctors, lawyers or engineers.

"If I had been born ten years earlier, it would have been illegal for me to go to Queen's University," he says. "It's unfortunate, but that's the history of Aboriginal people in Canada. Those are some of the impediments that our society has had to deal with."

At Queen's Dewasha received a firm grounding in civil engineering and picked up "soft" interpersonal skills whose value he would only fully understand many years later.

After his graduation in 1971, Dewasha worked for Parks Canada as an engineer on the Rideau Canal, then moved west to Saskatchewan to begin what became a 30-year career with the Department of Indian Affairs. His experiences there would shape his life's work.

As Dewasha travelled around the province on behalf of his employer, he was shocked by the Third-World quality of much native housing and infrastructure. He realized the shoddy construction was a consequence of the fact that reserves were a federal responsibility to which provincial housing, health and safety standards did not apply. As he worked his way up through the department to become a director of engineering – first in Saskatchewan in the mid-1970s, and later in Ontario – Dewasha became instrumental in developing the first building code for on-reserve housing and a training program for native housing inspectors.

Merv had other concerns. Most infrastructure work on reserves was carried out by non-native contractors, meaning that millions of dollars in wages were not benefitting the community. To rectify this, over the years, Dewasha worked to help First Nations communities assume responsibility for roads, schools, bridges, and water treatment plants – capital projects that had previously been controlled and managed by far-off Indian Affairs bureaucrats. He also helped to implement training and employment programs that ensured that Aboriginal people were part of work and maintenance crews.

Another Dewasha concern involved the funding of capital projects on reserves. Until 1994, the Indian Act prevented First Nations band councils from borrowing money, so a band that wanted to build, for example, a school, was required to apply to Indian Affairs for funding that might take years to arrive. Dewasha helped to orchestrate an arrangement whereby bands could take out bank loans that allowed them to build the school (or whatever it was they wished to build) long before the standard Indian Affairs funding would have arrived.

Dewasha has also undertaken numerous initiatives with banks, universities and colleges, professional associations, the Canadian Armed Forces and the National Research Council that underline his commitment to improving educational and employment opportunities in science and math for Aboriginal people. These include the creation of the non-profit Canadian Aboriginal Science and Engineering Association; a career symposium that showcases science- and math-related education, employment and trades opportunities open to Aboriginal youth; and, with the Canadian Construction Association, a program to certify trades and project managers among Aboriginal youth.

Although he is no longer directly involved with many of these ventures – his philosophy is to start something, then train others so that they can sustain the organization themselves – Dewasha is not resting on his laurels. These days the 64-year-old routinely works 60-to 80-hour weeks as the majority owner of Neegan Burnside Ltd. and Nuna Burnside Engineering and Environmental Ltd., companies that provide career development to Aboriginals and Inuit youth.

Merv Dewasha Sc'71 Civil

One of the firm's most recent successes was the engineering work on the Meno Ya Win Health Centre in Sioux Lookout, Ontario, a 140,000 square-foot facility that Dewasha says is a rarity among North American hospitals in that it treats patients using both Western medicine and traditional native healing practices.

The harmonious cultural co-existence that takes place at the new hospital reflects an approach that Dewasha has favored for decades.

"I tried to retire once, but the elders said that I was too young and had important knowledge that had to be passed on to the next generation," says Dewasha, who speaks with pride about the talented staff he has trained over the years to be fully competent engineers capable of working in different cultural settings all over the world. "I think that's sort of the last leg of my career, to provide leadership to Aboriginals in science and engineering through my companies so that they can work anywhere, with anyone."

THE Redferns

For John Redfern, the road to success has been paved with concrete.

The first job Redfern got after graduating in 1958 with a Queen's civil engineering degree was with the Ontario Department of Highways. He was charged with project-managing a five-mile section of the then-new Highway 401, just east of Kingston. At the time the roadway was being correctly promoted as one of the province's most important pieces of transportation infrastructure.

After completing his contract, Redfern found a job with the Canada Cement Company Limited as a technical sales engineer. Over the next decade he was employed in various sales and management positions in Ontario and the Maritimes, logging thousands of miles on the road to meet with customers in the construction and mining industries. While working in northern Ontario in the early 1960s he was instrumental in the development and use of cement stabilized hydraulic backfill at the Falconbridge and Inco mines, a method which has now become a standard practice in Canada.

The cement business evolved and grew in tandem with the ready-mix and pre-cast concrete industries, which were developing rapidly in the 1960s and would eventually all but supplant traditional on-site mixing.

In 1970 Canada Cement merged with Lafarge Canada to form Canada Cement Lafarge, and two years later, Redfern, who had risen quickly through the corporate ranks, was promoted as president of the firm's western region, which was stationed in Calgary. He moved to Montreal in 1974 as executive vice president, and on May 9th 1977 – his 42nd birthday – he was appointed as Canada Cement Lafarge's president and CEO.

During the 1990s, Redfern chaired The Coalition to Renew Canada's Infrastructure, a group of leading Canadian companies concerned about the poor state of Canada's infrastructure and its negative impact on the economy. His role involved leading public seminars and continuous interaction with federal and provincial officials. Though the coalition has disbanded, Redfern is still involved with infrastructure issues through his position as Chairman of the Advisory Board of Clean Water Resources (CWR), a firm involved in the design, construction management and funding of durable "green" infrastructure. The firm's work is done to a high-quality "performance" standard and involves the use of a specialized "green" concrete that results in longer-lasting infrastructure, lower life-cycle costs and a potential 70 per cent reduction in a project's greenhouse gas footprint.

How did North America find itself with an infrastructure deficit? As Redfern points out, planning for new roads, bridges, sewers and water mains has not been an area of keen interest among elected officials, except at election time.

"This is unfortunate, as every infrastructure decision is a political decision, and a political decision traditionally is not based on engineering or life cycle costs," says Redfern, noting that the lack of a long-term comprehensive plan for Canada's infrastructure needs has resulted in the current backlog of problems. This is gradually changing, however. In recent years, well-publicized instances of falling bridges, bursting pipes and environmental damage – some involving loss of human life – have awakened politicians to the fact that infrastructure decay is a matter of pressing national importance.

Professional work has been only one facet of Redfern's busy life. Over the years he has served on the boards of institutions including Carleton University, the Montreal General Hospital Foundation and the Boys and Girls Club of Canada. He chaired the Corporate Higher Education Forum and has been involved with many technical associations and charitable causes. In 2006 he was named a member of the Order of Canada for his work on infrastructure renewal.

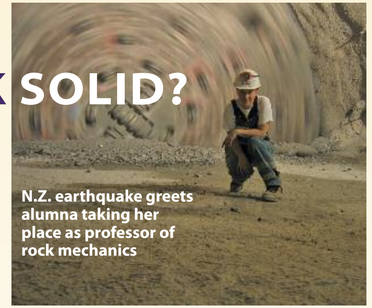
Redfern also maintains his Queen's connection through his participation in the activities of various alumni groups. In 2008 the Montreal Chapter named him as winner of the John B. Stirling Award for his many contributions. He has also served on the Board of the Queen's Center For Water and the Environment, and this fall he and his 1956 teammates returned to their alma mater to be inducted into the Queen's Football Hall of Fame.

John Redfern has been married to Ann (Watson) for 53 years, and they are the proud parents of four children. Collectively the family has earned some ten University degrees.

Attending Queen's is something of a Redfern family tradition. Redfern's father, Harry, brother Peter, and two of John's children, John and David, are Queen's graduates. These days, three of the senior John Redfern's six grandchildren are attending university (but to date, not at Queen's).

"It's up to our younger three grandchildren – or postgraduate studies for the older ones – to give the family a fourth generation of Queen's graduates," he jokes.

ROCK SOLID?



N.Z. earthquake greets alumna taking her place as professor of rock mechanics

Marlène Villeneuve, Sc'02 Geological Engineering, PHD'08

Dr. Marlène Villeneuve was delighted when she finally arrived in Christchurch to begin her new job. No matter that much of the New Zealand city was inundated with rubble, having survived a massive 7.1 earthquake the day before.

"It was pretty awesome, but I missed the worst of it," says Villeneuve, who is now safely ensconced in her new role as a professor of rock mechanics at the University of Canterbury. "Now we're just getting aftershocks. It was certainly a unique introduction to the country."

It's been a relatively quick trip to the halls of academe for Villeneuve, who completed her bachelors of science at Queen's in 2002. As an engineer, she worked hard and enjoyed various extracurricular campus activities, including "getting purple" and socializing at the Clark Hall pub. After graduating she directly started work on a Master's degree that studied the behaviour of landslides in western Canada – important subject matter for hydroelectric dams and mines in the region. Midway through her research, however, Dr. Mark Diederichs, a professor of Geological Engineering, told her about an intriguing research opportunity in Switzerland that he figured would make an excellent PhD thesis.

The project involved gathering excavation data during construction of the Gotthard Base Tunnel in Switzerland, one of the world's longest railway tunnels. Villeneuve leapt at the chance, and eventually found herself integrated with the contractor, Strabag. Her role was to collect rock samples from the tunnel in an attempt to determine what geological characteristics make some rocks stronger and others weaker. Such geological data is vital for tunnel contractors who must estimate the design, price and duration of billion-dollar projects as accurately as possible, since miscalculations could cost them millions in extra costs and penalties.

Knowing what sort of rock conditions they'll encounter helps them schedule the job, determine what sorts of supports they might need to install to limit displacement of the surrounding rock, avoid cost overruns and properly equip the Tunnel Boring Machines (TBM), the giant machines that do the actual digging. (In fact, Herrenknecht, a manufacturer of TBM's, funded her research.)

"The idea was to give the contractor a procedure for collecting this data early in the project and be able to identify what types of rock might give them trouble," says Villeneuve, who analyzed her samples and interpreted the data at Queen's. "It's critical to get the estimate right at the beginning."

The project included an unexpected diversion: Villeneuve earned her fifteen minutes of fame as an interview subject for a Canadian documentary crew that was filming a program about the Gotthard Base Tunnel for the Discovery Channel. "They didn't know I was there, but once they met me and found out I was Canadian, they revised their script to fit me in," she says. "You don't see much of me in the final show, but you hear my voice a lot."

After earning her Doctorate in 2008, Dr. Villeneuve landed a job in San Francisco with Jacobs Associates, a consulting engineering firm that designs everything from sewers to highway and train tunnels. Most of the jobs she worked on were in and around San Francisco, but last year the firm seconded her for a year to Brisbane, Australia, where she helped gather and analyze data for the 6.7-kilometre AirportLink, a $6-billion highway tunnel slated for completion in 2012. One of the challenges for Villeneuve and her colleagues was figuring out how to excavate under an urban area that included several heritage buildings that might be damaged by tunnel deformations. She counts that complex job as the climax of her professional career.

So far, that is.

This September, Villeneuve joined the faculty at the University of Canterbury, thus fulfilling one of her early career goals. At Queen's she'd been really impressed by Deidericks, her PhD supervisor, whose energy and enthusiasm for teaching and research opened her eyes to the possibilities of an academic career.

"That passion ran all through the department and was kind of infectious, so I always had the idea that I'd like to come back into academia," says Villeneuve. "But being an engineer, I wanted to go work in industry first so that when I came back and faced students I could say, 'This is how we did it, and here are pictures from projects that I actually worked on'."

In addition to fulfilling her academic responsibilities, Villeneuve is looking forward to consulting, which will allow her to keep current and scope out potential research projects for her students.

"I got to Switzerland because a professor of mine was consulting there and spotted a research opportunity," she says. "One of these days I'd like to do the same for one of my own students."

A life spent making things BETTER

A good mechanic can adjust a car's engine to make it run more smoothly and use less gas. Dr. Emil Nenniger operated on a larger scale: for four decades he worked in consulting engineering, sometimes diagnosing issues at old or malfunctioning industrial plants and upgrading them to make them cleaner and more efficient.

"You never went into a problematic situation knowing what to do until you and your team did a lot of work and finally felt you had a solution," says Nenniger. "But one enjoyable result was that I always felt I was learning something new."

A Montreal native, Nenniger enrolled in engineering at Queen's in the late 1940s, graduated in 1950 and earned a Masters degree from McGill a year later. Armed with these academic credentials, he soon landed a job with an industrial gas producer, Air Liquide, which had just sold two gas separation plants in West Virginia and Texas. Nenniger was tasked with supervising the start-up and designing modifications to pass acceptance tests for the new owner – a serious assignment for a 23-year-old neophyte.

Three years later he was offered a prestigious Imperial Chemical Industries (ICI) fellowship to pursue a doctorate in chemical engineering at the University of Manchester, England. In 1956 the newly minted Dr. Nenniger was invited to establish a process-engineering department at his father's Montreal firm – Surveyer, Nenniger & Chênevert (now SNC-Lavalin), which would achieve renown as the designer of the gargantuan multiple-arch Manic 5 hydroelectric dam in northern Quebec. At SNC he became a partner, then director, and worked on projects including a new sodium chlorate plant in Beauharnois, a zinc smelter in Oklahoma and a proposed ilmenite smelter in south India. While consulting on the latter job he met Gerry Hatch, who headed Hatch Associates, an engineering firm that then had about 100 employees. Hatch extended an open invitation to Nenniger to join the firm. In 1967, he did.

One of the highlights of Nenniger's globetrotting years with Hatch – now a Canadian engineering powerhouse with over 8,000 employees in 65 offices around the world – was overseeing the retrofit of a notoriously dirty zinc smelter in St. Louis, MO, that had been all but condemned. Over a period of years, and in the days before environmental responsibility was on the public radar, Nenniger introduced changes to processes and equipment that reduced the plant's water usage and toxic effluent amounts by some 90 percent. Nenniger still gets Christmas cards from some of the people he worked with on the project.

Nenniger retired in 1990, and enjoys making improvements to a maple syrup farm near Guelph, Ontario he founded with his family 30 years ago and which at its peak produced more than 1000 containers of flavorful, award-winning syrup. He also takes great satisfaction in hearing from recipients of the Emil Nenniger International Exchange Scholarship in Chemical Engineering, which he established in 2003 and is awarded annually to a third-year chemical engineering student at Queen's to help them gain practical experience abroad. The contact with students reminds him of his ten years as a part-time chemical-engineering lecturer at McGill University in the 1960s, an activity he still counts as one of his most meaningful contributions to engineering.

But the lure of real-world engineering remains: with his son, John, Nenniger is working to commercialize a process they developed and patented that uses soluble gas to simplify extraction of bitumen from the Alberta oil sands. It's cleaner, uses no water and far less energy than current steam-extraction methods, and the senior Nenniger – a fellow of the Canadian Academy of Engineering since 1991 – is confident that this will prove to be an important engineering legacy. "At the moment it's not moving forward at a great rate," he says of the process, which is being co-developed with Hatch. "But in the long run, it's going to be something."

Dr. Emil Nenniger *(left)*, Sc'50 Chemical

THE Marstons

When Don Marston chose Queen's in 1952 for an education in mining engineering, he had no idea that he would be establishing a family tradition. His university education, however, had a strong impression on him – and today, over half a century later, he counts seven Queen's grads or future grads in his immediate family – along with many more working at Marston's international mining consulting firm.

Don Marston joined Queen's after a year at Lakehead Tech (now Lakehead University), which at the time had an affiliation with Queen's. He recalls a heavy workload, but also a tremendous amount of school spirit and enthusiasm. "Queen's is where I met lifelong friends, colleagues and peers in the mining industry," he says. As evidence of the work expected of students, Marston notes that he played on both the football and basketball teams, but was forced to quit the latter because games conflicted with his Saturday classes, which could not be skipped.

Marston graduated in 1955 and, in 1977, after working in a wide range of mining operations, founded Marston & Marston Inc., an international full-service mining consulting and geological consulting organization with extensive consulting experience in open pit and underground coal, metals, oil sands and industrial minerals mines. He kept in touch with his old school colleagues – and in fact was asked back to the campus as a special lecturer on mine maintenance. When one of those colleagues, Alan Bauer, became Head of the Department of Mining Engineering, Marston asked him to visit and help convince his two sons to study at Queen's.

Richard Marston (AppSci '80), had originally considered mining engineering at another university, but Professor Bauer and his father's 'strong encouragement', along with a visit to Queen's, changed his mind. "When I came up to see the campus, a number of grads toured me around and pretty much talked me into a career in mining," he says. "They – and my father – were very persuasive!" Richard's brother David followed in his footsteps and both ended up graduating from Queen's in Mining Engineering – Richard in 1980 and David in 1983.

Both also met their future wives on campus – Richard's wife Lisa graduated from Applied Science, Metallurgical Engineering in 1981 and David's wife Jane graduated from Queen's Nursing in 1983. Not surprisingly, David and Jane's two sons continue to uphold the family tradition - both currently attend Queen's, one in Mining Engineering.

Like his father, Richard Marston recalls a 'work hard, play hard' mentality during his time at Queen's. "The camaraderie and social opportunities are important, because these are relationships that last a lifetime," he says. "It was a challenging course of study that required a great deal of effort, but we also dedicated time to building teams and friendships that continue to this day. That spirit, and the high caliber of the education, is what sets Queen's apart." Recruiters at Marston & Marston Inc.'s U.S. offices and Marston Canada Ltd. in Calgary look for these qualities and often place Queen's grads at the top of their hiring list, particularly for their Calgary office.

Today's mining engineer must be able to think globally, says Richard Marston. "Most of our engineers find themselves in remote locations around the world in a completely different cultural setting." He advises students to take Spanish or another relevant language, and to learn more about the people who will be working alongside them. "Whether you are working in the oil sands of Alberta, on a mountaintop in Peru or in a jungle in Asia, it's important to be tolerant of different ideas and to understand the impact of the mining project on the local community."

Both Don and Richard Marston believe that today's mining engineer must be a well-rounded critical thinker with a wide range of mining expertise and the ability to problem-solve, skills that they themselves developed during their time at Queen's. "My education, along with the strong collegial opportunities at Queen's, gave me the ability, confidence and network to succeed," says Richard Marston. "That's the value of the Queen's spirit!"

The story of the Faculty of Engineering and Applied Science really begins on a voyage across Canada.

It was the summer of 1872, and George Monro Grant was travelling by steamship, canoe, horseback, and on foot across Canada with Sandford Fleming, the chief engineer of the Canadian Pacific Railway. Their exploration opened Grant's eyes to the work of engineers, and marked the beginning of a lifelong friendship with Fleming.

Grant never forgot that journey – and when he became Principal of Queen's College in 1877, he soon began scheming about ways to create a Faculty of Applied Science to educate the engineers needed to build and unite the country.

Queen's, however, could not afford a new Faculty without help, and the provincial government would not provide Queen's with any funding as long as it was a denominational university affiliated with the Presbyterian Church.

Grant was undaunted. He pitched the concept of a School of Mining and Agriculture – an independent school that would lease space from Queen's and 'borrow' professors – and convinced the provincial government to provide the necessary funding. The School opened in 1893 and the Faculty was created in 1894, with Nathan Dupuis as its first Dean. Although it was officially called the Faculty of Applied Science, it was usually referred to as the Faculty of Practical Science (then the most common term).

In 1916, Queen's separated from the Presbyterian Church, and the School and Faculty were finally united as the modern Faculty of Applied Science.

In 1993, the Faculty celebrated its centennial anniversary.

Today, George Grant would indeed be proud. The Faculty of Engineering and Applied Science has thrived, and offers degree programs in 10 fields of engineering. It is the second-largest faculty on campus, and one of the most respected engineering schools in Canada. True to Grant's dream, the Faculty has produced many nation builders and global leaders – and its graduates continue to play an important role in designing, building and responding to the evolving needs of a global society.

*The journey from **MINING AND AGRICULTURE** to **ENGINEERING AND APPLIED SCIENCE** has been long, with more than a few twists and turns along the way....*

1893
Queen's Principal George Grant founds the Kingston School of Mining and Agriculture in Carruthers Hall, with five students and three professors: William Goodwin, William Nicol and Willet Miller

1894
The "Faculty of Applied Science" appears in the 1894-95 University Calendar, with Nathan Dupuis named as the first Dean of the new Faculty

1897
The Engineering Society is formed to promote social functions and offer guidance to Science students

1901
Queen's passes a bill to provide a $22,500 per annum grant for five years to expand the Applied Science program

1903
Fleming and Ontario Halls are built, and 120 students are enrolled in the School

1909
School enrolment reaches 310 students, precipitating the need to build Gordon Hall

1914
The Queen's-based Fifth Field Company of the Canadian Militia becomes the first university engineering company in Canada, and the first to be deployed overseas

1916
Due to the war, only nine students enroll in the School

1917
Dean Nathan Dupuis retires and is replaced by William Goodwin, the first Director of the School of Mining

1919
Dean Goodwin retires; Arthur Clark takes on the role and creates Canada's first Engineering Physics program

1921
The University begins plans to build a new power plant on the shores of Lake Ontario to replace the one at Fleming Hall

1930
The first Science Formal is held

1932
As the Depression hits, Applied Science experiences its lowest enrolment of the decade at 424 students

1941
The Science '44 Co-op is created to provide reasonably priced rooms for students

1943
Arthur Clark retires as Dean at the age of 70, and Doug Ellis, one of the original members of the Fifth Field Company, becomes Dean

1946
Dorothy Heartz, is the first woman to graduate from Applied Science

1948
The Class of '48½, made up of mostly veterans, graduates

1951
Clark Hall, funded entirely by students, is completed and houses the Technical Supplies Bookstore and clubrooms

1957
The first 'greasepole climb', using a goalpost stolen from the University of Toronto, is completed. There were earlier 'greasy climbs', but the Class of '59 asserts it was the first to establish the current tradition using the U of T pole

1962
Tuition climbs to the $600 range

1967
Golden Words, the Engineering Society's newspaper, publishes its first edition on January 24th

1967
User-interactive computer terminals are introduced to students

1970s
First Engineering frosh are painted purple in honour of the engineers who died on the Titanic (in 1990, this tradition changed to allow only upper years to dye themselves)

1971
The Engineering Pub (later known as "Ritual") is held every Friday afternoon from 3 – 6 pm

1972
Clark Hall Pub is officially born

1972
The CAB (Canadian Accreditation Board) is invited on campus to evaluate the individual programs offered by the Department of Engineering, resulting in several degree name changes

1983
The Microcomputer Study Group is formed, a response to the latest craze on campus – personal computers

1986
Genevieve Dumas becomes the first full-time female member of the Applied Science faculty

1993
Applied Science celebrates its centennial anniversary

1998
The Engineering Society celebrates its centennial anniversary

2004
Beamish Munro Hall is opened and touted as one of the most environmentally advanced buildings in Canada. It garners many awards, including the Royal Architectural Institute of Canada's Award of Excellence, the City of Kingston Livable City Design Award. It was selected by the Canada Green Building Council as one of three Canadian projects to represent Canada at the 2005 World Sustainable Building Conference in Tokyo

2008
Innovation Park, home to many Applied Science research centres and commercial spin-off companies, opens its doors at the former Alcan site in Kingston

2008
A newly renovated Clark Hall Pub is re-opened

2009
Alumnus Robert Buchan donates $10M to the Department of Mining, which is re-named in his honour

2010
The Faculty is renamed The Faculty of Engineering and Applied Science to better reflect its true nature

FOUNDERS: the names behind the buildings...

CLARK HALL
Arthur Clark (1873-1956)
Clark was the third Dean of Applied Science, and held the position for 24 years. He promoted research-based teaching and designed the Engineering Physics program in 1919, believed to have been the first of its kind in Canada. He also steered the Faculty through the Depression, and worked to expand the depth and quality of programs. The building of Clark Hall was funded entirely by engineering students, who insisted that it bear the Dean's name in his honour.

ELLIS HALL
Douglas Ellis (1885-1955)
Douglas Ellis served as a Lieutenant in the Queen's Fifth Field Company during WWI, and after the war, returned to Queen's to join the Department of Civil Engineering, focusing mainly on hydraulics. He served as Dean from 1943 – 55, and had the difficult task of managing an overcrowded Faculty at a time when interest in science had increased dramatically. During his time as Dean, the first Advisory Council was created, providing a link to industry leaders and resulting in a number of important gifts of equipment to the Faculty.

DUPUIS HALL
Nathan Dupuis (1836-1917)
Nathan Fellowes Dupuis was a clockmaker before becoming a Professor of Chemistry and Natural History in 1868 – and in fact designed and built the clock that perched at the top of Grant Hall for fifty years. As the first Dean of the Faculty of Practical Science, he played an important role in the development of the school and its programs. Dupuis oversaw the completion of the University's first mechanical laboratory (known as the Mill) in 1896, and also helped Professor Goodwin design Carruthers Hall.

GOODWIN HALL
William Goodwin (1856-1941)
Professor Goodwin was the first Director of the School of Mining and Agriculture when it opened, and is also known as the man who brought electricity to Kingston for the first time, installing a generator in Carruthers Hall (which he also designed). He succeeded Nathan Dupuis as Dean and was instrumental in establishing and guiding the Faculty of Applied Science at a crucial time in its history. Goodwin is often credited as being the major force behind the development of the School of Mining, creating the foundation for the successful school that it is today.

FLEMING HALL
Sir Sandford Fleming (1827-1915)
Sir Sandford Fleming served as the Chancellor of Queen's University for 35 years – but his initial contribution to the University occurred well before his appointment. In 1872, as Chief Engineer for the Canadian Pacific Railway, he invited George Monro Grant to join him on a surveying expedition across Canada – a journey that convinced Grant of the need for a Faculty of Applied Science at Queen's. Fleming also developed the standard system of time zones that is still in use today, and was a staunch supporter of Queen's until his death in 1915.

GRANT HALL
Rev. George Monro Grant (1835-1902)
During his 25-year term as Principal, George Grant transformed Queen's from a struggling and impoverished Presbyterian college into a national university with a reputation for excellence. After traveling across Canada with Sandford Fleming, he became convinced of the need to train more engineers, and cleverly secured government funding to do so despite the University's affiliation with the church by creating a separate School of Mining and Agriculture. Grant went on to raise funds for numerous buildings and equipment, and is considered to be one of the major founders of the Faculty of Applied Science.

MCLAUGHLIN HALL
Robert Samuel McLaughlin (1871-1972)
At the age of 16, R. Samuel McLaughlin began working as an apprentice upholsterer in his father's carriage factory in Oshawa and quickly worked his way up to president of the company that eventually became General Motors. He was a personal friend of Principal Wallace and Chancellor Dunning, and in total, donated about $4.5 M to Queen's. Legend has it that Dunning passed a note to Col. McLaughlin during a CPR board meeting that simply said "Queen's needs a new mechanical engineering building." McLaughlin financed both the construction and later improvements of McLaughlin Hall, which was built in 1948.

MILLER HALL
Willet Green Miller (1867-1925)
Willet Miller joined Queen's as a Professor of Geology and Petrography in 1893 and is credited with making many great contributions to the School of Mining. In 1902, he was appointed the first Provincial Geologist of Ontario. Miller discovered cobalt and silver in northern Ontario, and also created a method for identifying diamonds and emeralds using x-rays.

NICOL HALL
William Nicol (1861-1924)
Originally a student at Queen's, William Nicol returned to Queen's in 1896 as a Professor of Mineralogy. He was known as a strict disciplinarian in the classroom but was also known to provide financial support to students in need. Nicol was a great collector of mineral samples, and donated them to Queen's, where they are still displayed today as part of the Miller Museum of Geology. His generous donation of $40,000 to the University resulted in the building of Nicol Hall.

BEAMISH-MUNRO HALL
The home of the Integrated Learning Center, Beamish-Munro Hall opened its doors in 2004. It was through the generous support of visionary alumni Bob Beamish, Don Munro and others that the Faculty was able to create this award winning, state-of-the-art facility.

Robert Beamish
Robert Beamish (Sc'60) began his career at Monsanto, working his way up to the position of president in 1976. Two years later, he and a partner purchased Monsanto's Urethane Foam Division, which became the Woodbridge Foam Corporation. Today, the company has grown to 66 facilities throughout North and South America, Europe and Asia Pacific, offering a wide range of products and services

Donald Munro
After graduating from Queen's, Donald Munro (Sc'52) began his career as a Field Estimator with Robertson-Yates Corporation, eventually becoming its President in 1971. Along with overseeing the construction of several landmarks, including five-star hotels in Bermuda, the University of Toronto John Robarts Library and the Butterfly Conservatory in Niagara Falls, he was a Director of the Canadian Construction Association and Chairman of the Council of Ontario Contractors Association.

Nathan Dupuis designed and built the first Grant Hall clock – and he helped design Carruthers Hall

Clark Hall was funded completely by engineering students, including a large donation from the Fifth Field Company – students who served in WWI

The first woman graduated from Applied Science in 1946

William Goodwin brought electricity to Kingston

Freshmen in the 1930s were required to carry orange umbrellas until Christmas – or face being tried in 'Science Court'!

In the 1890s, courses were offered in cheese and butter processing, veterinary practices and navigation

Did **YOU** know....

The Campus Bookstore was originally the Technical Supplies Store – opened in 1909 by the Engineering Society to provide drafting supplies and textbooks

THEN and NOW

THEN
Technical Supplies Store
First-year fees (1906): $40
Number of students (1912): 246
Queen's Café
Greasepole climb ('77): 17 minutes
Number of female graduates (1946): 1
Bitter Grounds
Courses in 'Mechanism'

NOW
Campus Bookstore
First year fees (2010): $8,874
Number of students (2010): 1900
Tea Room
Greasepole climb ('01): 117 minutes
Number of female graduates (2010): 127
Common Ground
Courses in Computational Fluid Dynamics

Engineer – *ORIGIN Middle English (denoting a designer and constructor of fortifications and weapons; formerly also as engineer): in early use from Old French engigneor, from medieval Latin ingeniator, from ingeniare: 'contrive, devise'*

Although the term engineer wasn't coined until 1325, the first inventors of pulleys, levers and wheels can be considered the ancestors of this noble profession. Working with sometimes limited knowledge and little collaboration, these creators designed and built the devices that met the needs of their society.

As that society evolved, so did our engineers. During the Renaissance, electrical, mechanical and civil specialties were developed – and in 1698, mechanical engineer Thomas Savery invented the first steam engine, giving rise to the Industrial Revolution. Engineering as a profession took on new prominence as industry began mass production of goods and cities expanded their infrastructure to accommodate the millions eager to explore a more urban lifestyle.

In the late 18th century, marine engineering gained popularity and allowed us to explore the as yet unknown ocean floor. In the early 1800s, engineering schools appeared around the world and the profession gained new prominence and specializations.

On a windy North Carolina day in 1903, Orville and Wilbur Wright opened the door to aerospace engineering by proving that airplanes could fly. Later, in 1922, the Ritual of the Calling of an Engineer was born by the Engineering Institute of Canada to bring members of the profession closer together.

Today, engineers continue to expand their knowledge in practically every field of science, tackling new problems and seeking out creative solutions for global challenges. The tools may have changed for the engineer, but the basic code the engineer lives by remains the same: to apply math and science in service of mankind, and to uphold the highest standards of personal honour and professional integrity.

Queen's engineer seeks to conquer the highest peaks on 7 continents

5 down, 2 to go

In May 2003, when Adam Janikowski received his Classics degree from Queen's – his second, having earned a Chemical Engineering degree a year earlier – he felt on top of the world. Six years later, he'd actually be there.

The Picton, Ontario native and son of Queen's alum Andrew Janikowski (Meds'75), Adam has always loved outdoor adventure. Through his teens he worked as a councilor at summer camps. Later he became a scuba diver, a lifeguard and a ski patroller. Now, with Mount Everest behind him, he's climbed the highest summits on five of the seven continents – and he'd like to knock off the rest.

Janikowski took up mountaineering in 2001 during a family trip to Africa in which he, his father and sister Tine Schaffer (BSc Mining Eng.'99, MSc Chem Eng) summited the 5,893-metre Mount Kilimanjaro, the continent's highest mountain. Adam enjoyed the experience so much that, after earning his Classics degree, he rewarded himself with a trip to Argentina, where he scaled the 6,962-metre Cerro Aconcagua, South America's highest peak.

During the summer of his final year at Queen's, Janikowski worked at an oil and gas company in Calgary. Following graduation he returned to the city, uncertain whether to capitalize on his engineering education by pursuing a career in the technical side of the business or in finance. The latter subject had piqued his interest when he chaired the board of directors of Queen's Campus Bookstore, which is owned and operated by engineers and which generates more than $10 million in annual revenue.

The finance option ultimately won the day. But while Calgary was tantalizingly close to the ski slopes of the Rockies, Janikowski had always yearned to live in London, England, so he engineered a role for himself at a Canadian investment bank that had an office in the city and made the move. He ensured that he'd be entitled to five weeks holiday per year – enough to cram in a few adventures.

"[Investment banking] isn't the driving force in my life," admits the 31-year-old, who is now a vice-president who deals with oil and gas companies outside North America. "I've had some success, but work is really just a way to fund my extracurricular activities."

One of those activities consisted of climbing Denali – also known as Mount McKinley – in Alaska. He spent three grueling weeks on the 6,194-metre peak in 2006 – including four days cooped up in a tent during a four-day blizzard – and reached the top. That was rewarding, but so was the time he spent with his tentmate, an American medical doctor and astronaut named Scott Parazynski. The two hit it off.

It wouldn't be the last time they'd be together. In December 2007 Parazynski phoned Janikowski with a tempting offer: would he be interested in climbing Mount Everest?

"It wasn't like opportunity was knocking, it was trying to force the door open," recalls Janikowski.

It was an expensive commitment that would mean two-and-a-half months away from family and friends. Nevertheless, after getting leave from work and clearance from his wife, Maribeth Williams (ArtsSci '02), five months later he found himself acclimatizing himself to the thin air on the world's loftiest mountain.

Adam Janikowski, Sc'02 Chemical Engineering, Artsci'03 Classical Studies, on top of Mount Everest

It was a strange time to be there. It was just before the Beijing Olympics, and the Chinese government had purchased all the Everest climbing permits from the Nepalese government in an attempt to clear climbers from the mountain's south side so that a Chinese team could carry the Olympic torch to the summit from the north. But since emptying the Nepalese side would have devastated the local villages that rely heavily on expeditions for income, the Chinese agreed to allow a few teams onto the mountain on the condition that they'd be able to keep tabs on them.

To that end, a Chinese representative was posted to Janikowski's team. Satellite calls were monitored, and videocameras confiscated. Undeterred, Janikowski, Parazynski and their Sherpa guides slogged to the highest camp, and on May 22, 2008, Adam finally stood on the roof of the world. Sadly, Parazynski had injured his back that day and was unable to complete the climb. He was airlifted off the mountain for surgery, but returned the next year to finish the job.

Janikowski says climbing has brought him in contact with some very interesting people. There was Parazynski the astronaut, and an oil-patch CEO with whom he climbed Russia's Mount Elbrus, Europe's highest peak. On one climb he met Prince Charles' surgeon, on another, a fellow who held a PhD in chemistry and who had literally run around the world for charity.

Queen's , too, also helped Janikowski forge some strong relationships. He met his wife there, and five of the six groomsmen at their wedding were fellow Queen's engineers. As a student he participated in varsity rugby, wrestling and downhill skiing, and still counts many of his teammates as friends. Today he's a member of the University Council and regularly contributes to fundraising campaigns.

"Queen's and my engineering education are so vitally important to who I am, it's almost part of my DNA," says Janikowski. "Even today, if I walk into a room anywhere in the world and meet someone wearing an iron ring, there's an instant connection."

Get the **BALANCE** right

Ross Jackson, Sc'60, Physics

From finance to eco-villages and organic farming, ROSS JACKSON seeks sustainability

As a thinker, entrepreneur, author, activist and chair of a Danish foundation that supports renewable energy and sustainable living, Ross Jackson is trying to steer humanity on a different, more nature-oriented way of life.

As a young man growing up in Ottawa, Jackson followed global issues such as overpopulation, which already in the 1950s was touted as a critical threat to human existence. Today the threats are different: global warming, overconsumption, overpopulation and species extinction. Some would also add the looming specter of declining oil availability, and Jackson agrees.

"The greatest short-term threat to our way of life is peak oil, the point coming very soon when demand for oil and gas will permanently outstrip supply," he says. "We are on the threshold of a major discontinuity in human history."

It has been a unique and circuitous path to his current situation. Jackson trained as an engineer for two years at Carleton University, and transferred in third year to Queen's to finish his degree. It didn't take him long to plunge into campus life: in February of his first year at Queen's he was elected president of the Engineering Society, a hectic job that filled his non-academic hours with administrative and committee duties.

On his graduation in 1960 he relocated to Indiana to pursue a Masters degree in Industrial Management at Purdue University, and followed that up with a doctorate in Operations Research from Case (now Case Western Reserve) University in Cleveland, Ohio.

Operations research is a specialized branch of economics that uses mathematics and statistical analysis to solve complex problems. Jackson moved to Denmark in 1964, having found a job at the fast-rising computer giant, IBM, where his skill set was in demand. He intended to stay for a couple of years to get a foothold in the information-technology industry, which he did. But he also met his future wife, Hildur, an activist who looked at things in a very different way that appealed to him, and has lived in Denmark since.

"I was a very top-down, corporate executive type," says Jackson. "She was a grassroots activist, and she made me more aware of that side of things. Today I have one foot in each camp."

In 1966 Jackson and a colleague from Case Western formed a management consultancy that advised on problem-solving strategies for industries including shipping, banking, transportation, publishing, manufacturing, insurance, tobacco, pension funds, slaughterhouses and dairies. In 1970 the pair founded SimCorp, a software firm that made financial software and is now one of the largest of its kind in Europe. Later Jackson began focusing more on international finance, consulting around the world on investment strategies for banks, insurance companies and mutual fund providers. This led Jackson into research in currency trading methods and the creation of various investment strategies that capitalized on his operations research approach.

But Jackson's involvement in the foreign exchange markets had persuaded him that while aspects of international trade and finance were enriching corporations and their shareholders (and himself) – as they were supposed to – they were also perpetuating generations-old cycles of poverty and environmental destruction, particularly in developing countries.

His view on these matters took a more philosophical turn in the early 1980s when he travelled to India and met Muktananda, a Hindu swami whose teaching led Jackson to an epiphany.

"I felt a divine connection," he says. "Material things meant less after that."

Jackson described his wakening in a book, *Kali Yuga Odyssey: A Spiritual Journey*, published in 2000.

His newfound consciousness reinforced his growing sense that humanity needed to move in a different direction that was more respectful of nature and the environment. In 1987, this notion prompted him to establish Gaia Trust (www.gaia.org), a foundation that supports a more holistic way of life and sustainable projects such as self-sufficient "eco-villages" where people grow their own food, know each other personally and collectively live in harmony with the earth. Describing his conversion from businessman to environmental activist, Jackson penned a second autobiographical book, *And We ARE doing it: Building an Ecovillage Future*, in 2000. Since its inception, Gaia Trust has funded more than 300 projects in over 40 countries, primarily supporting the Global Ecovillage Network and Gaia Education, an educational program in sustainability design, while investing in several Danish "green" startups – including small windmills, solar panels, and organic food producers.

Ironically, he now feels that many of the economic ideas and institutions he once favoured are counterproductive, and even dangerous. He is now writing a book entitled *Breakaway* – in which he says, for instance, that complex financial instruments such as naked derivatives should be banned. Moreover, he recommends that the World Trade Organization should be replaced by a new trade organization that permits restrictions on global capital flows and allows protective tariffs so that all countries, but particularly small or developing nations, can have more fiscal and cultural independence and better protect the environment.

It is critical, says Jackson, that all countries should be able to put tariffs on imports from polluting corporations and industries. "As it is now, the WTO allows the most polluting companies to be rewarded with the largest market share," says Jackson. "That has to change. We need to harness the private sector's creativity in a legal framework that is protective of the environment."

Ross Jackson's interests are very broad. He recently wrote a two-volume work (novel plus documentation) called *Shaker of the Speare*, on the life of philosopher Francis Bacon, who, according to Jackson and many others who have studied the matter, wrote Shakespeare's works under a pseudonym. (See www.ross-jackson.com).

When he's not writing Jackson serves as a director and principal shareholder of Urtekram, Scandinavia's largest organic-foods wholesaler, and oversees a handful of family-owned companies. He recently purchased a 20-hectare farm, which, although it's too small to build an eco-village on, is large enough to accommodate occasional workshops on the subject.

EDE map: Global Ecovillage Network (GEN) living learning centres

Breaking down a **PROBLEM** and **REBUILDING** something out of the **PIECES**

Steven Woods has always liked breaking things down and analyzing their constituent parts. Perhaps this isn't surprising, given that his father was a plant geneticist whose job was to reconfigure the DNA of canola and other oil-producing crops to make them faster growing or more drought resistant.

Steven's predilection for things scientific led him to Queen's in 1992 and where the Engineering Physics program. It was the perfect environment: the class was small, consisting of about 40 extremely bright students who, like Woods, welcomed the challenge of solving difficult problems and had a desire to solve bigger ones.

"As undergraduates, we knew we weren't at the forefront of physics, but we saw where that forefront was and really got an understanding that if we wanted to tackle something that hadn't been done before, there was a path to get there," says Woods. "It was no longer something that seemed so out of reach."

After graduating in 1996, Woods became a process engineer at Celestica, a multinational firm that helps companies develop, launch and market new products, and immersed himself in the world of software systems. From there he moved to Ehvert Engineering, a software consulting firm where he further refined his skills. At Ehvert he met Abe Wagner, another Queen's engineering grad two years his junior who shared the same work-hard, play-hard ethic that was the norm at Queen's.

Steven Woods, Sc'96 Engineering Physics and Abe Wagner Sc'98 Math & Engineering

It was an exciting time to be in the computer industry. The dot-com and e-commerce world was growing at a furious pace, and eager software designers were tripping over themselves trying to develop the next great product that would take the Internet by storm. Woods and Wagner were in the thick of it.

"We had all this energy, we saw that the Internet was growing at a tremendous speed, and we wanted to do something with it," recalls Wagner. "Fortunately we knew the right people to help make that happen."

Around 1999, along with a group of eight Queen's alumni they had connected with via the faculty grapevine, Woods, Wagner and Mark Organ (Life Sciences, '96) began zeroing in on an idea. Most successful e-commerce sites, such as the online retailer Amazon.com, were based on completing secure transactions for purchases of CDs, books and other consumer items. In that now-common model, the buyer chooses what she wants by clicking on it, which puts the product into an online "shopping cart". The contents of the cart are paid for via credit card and shipped to a location specified by the buyer.

Buying a CD online – an example of a consumer "commodity purchase" – is relatively straightforward. But Woods and his colleagues began wondering how the Web could assist in business-to-business purchases of complex, high-expense items such as computer network systems, financial services or hospital laboratory equipment. In such "considered purchases", typically worth over $100,000, several people may have a stake, and a say, in the buying decision. And it was this realization that transformed Woods from being an engineer only, to an engineer-entrepreneur.

"We were interested in things that didn't fit the shopping-cart metaphor," explains Woods. "So, given that observation and the ability to break down a problem into its parts and rebuild something out of it that had come from the engineering and engineering physics

Just some of the Queen's Alumni at Eloqua's Toronto Office. BACK ROW: Aaron Riley, Sc'03 (ELEC), Vic Almeida, Artsci'04 CompScience, Paul Teshima, Sc'95 EngPhys, Jocelyn Brown, Artsci'98 Politics, Adrian Chang, Artsci'03 Economics, FRONT ROW: Steve, Abe and Ralf Riekers, Sc'95

discipline, we brainstormed what was possible and thought, 'There's a business here.'"

The result of this brainstorming was a company called Eloqua, which Woods co-founded in 1999 with Wagner and Organ. Eloqua helps corporate marketers identify potential customers through their online behavior. For example, imagine you head a company that sells computer-networking equipment, and you have a website that customers use to learn about your product line. Eloqua allows your marketing department to analyze the online behavior of your website visitors – the pages they visit, the files they download, the videos they watch – to get a sense of what they're interested in buying. That information can be passed to the sales department, which can then direct its sales team to contact the various people from a given company who have demonstrated an interest in your product.

"If you suddenly see five people from a certain organization and they're all over your white papers and case studies and their Google searches are for the right set of terms, well, that is probably an indication that something is happening at that organization," explains Woods, who is Eloqua's Chief Technology Officer. "You need to get your sales people talking to them and helping them figure out the right answer."

One advantage Eloqua has over its handful of competitors is that it was one of the first companies to adopt what's known as a "cloud computing" platform. This means that, instead of manufacturing and selling boxed software meant to be installed on individual computers, Eloqua maintains a set of massive servers that provide the firm's services to subscribers via the web.

"Right now, cloud computing has almost unlimited potential for growth," says Wagner, who is Eloqua's VP of Engineering. "Eloqua's platform and our direct connections to other technologies in the cloud have us well positioned for the future."

Today, Eloqua is an industry leader and is growing fast, with some 250 employees in Toronto, Boston, San Francisco, Austin and Washington, D.C., London, England and Singapore. Employees are chosen according to how well they mesh with the culture that the founders feel most comfortable with.

"You need to find staff who can manage that balance between learning from past experiences and challenging convention in order to move toward the future. It's a balance that is often surprisingly difficult to find," says Woods. "That's why we've always been very happy with Queen's grads – you get a sort of energy there in terms of the attitude of working hard, of balancing the technology and business aspects of what we do."

Giving people the **TOOLS** to **SUCCEED**

Peter Kenny grew up on a farm near Stratford, Ontario, and learned about the value of hard work and self-sufficiency at an early age. Today, after a successful 53-year career as an engineer and entrepreneur, he's come full circle as a philanthropist who helps other people around the world, including farmers, become more independent so they, too, can succeed.

Kenny's family stressed the value of education, so after high school Peter applied to the Queen's Department of Mechanical Engineering, one of Canada's top schools. He graduated in 1955, and the next year supplemented his technical training with business acumen by taking an MBA program at the University of Western Ontario.

Peter Kenny, Sc'60, and his wife Joanne

After graduating in 1957 he returned to Stratford for a job at an engineering firm headed by Oliver Gaffney (Sc'44), a family friend. In 1960 he went to work for another Queen's alumnus, Roy Hurd (Sc'48½) who managed London Concrete Machinery. It would prove to be fruitful partnership.

In 1965 Kenny became a co-founder and shareholder with Hurd and Norm Hartviksen (Sc'57), another Queen's engineer, in Kanmet Casting Ltd., a Cambridge, Ontario foundry that cast parts for the agricultural industry. The company was acquired in 1974 by its biggest customer, Massey Ferguson, the legendary Canadian tractor manufacturer.

Kenny's next venture, in 1975, was with Roy Hurd in Neelon Casting Ltd. a Sudbury foundry that primarily cast disc brake rotors and was sold to Dana Corp. in 1994. In the meantime, Kenny became a founding investor with Roy's son, Gordon, of a firm that has evolved into North American Stamping Group, which turns out various components for the auto industry and which has six plants in Canada, the U.S. and Mexico.

Another opportunity came along via Dennis Hurd (Sc'65), another son of Roy Hurd. In 1983, Dennis approached his father and Kenny with an idea.

"He wanted to build an underwater bus that would take people about 150 feet down to observe the wonders of the ocean," recalls Kenny. "It sounded good to me, so his father and I backed him."

Today, Atlantis Submarines operates eleven submarines now operating in Hawaii, Guam, Barbados, Cozumel, Aruba and Grand Cayman. Over the past 25 years the fleet of $6-million vessels has carried some 13 million passengers on underwater sightseeing trips. As well, Dennis Hurd and his collaborators have worked with the U.S. Coast Guard and the U.S. Bureau of Shipping to set the standards for passenger submersibles the world over. Kenny is chairman of Atlantis Submersibles.

"We created the industry," says Kenny, who credits Dennis Hurd with being the driving force behind Atlantis's remarkable evolution. "It just goes to show that a big part of success involves partnering with the right people."

Kenny is a longtime supporter of Queen's who has established a pair of engineering scholarships, and he is a faithful attendee of his graduating class's five-year reunions. Much of his time is taken up by his role as head of the Kenny Family Foundation, which funds projects that help people overcome challenges – particularly lack of education – that hinder them from achieving their full potential. Kenny is hands-on about the work: he and other family members personally visit every project site to audit its progress.

"We don't just throw money at things," he says. "Businesses only become successful through the efforts of people, and sometimes all they need are the tools to succeed. Our goal is to provide those tools so that people can become more self-sufficient and remove the barriers to success themselves."

To that end, the Kenny Foundation has backed a diverse number of projects – including the Queen's Project on International Development (QPID), which sends students on summer

One of the projects that the Kenny Foundation sponsors is the annual "Books, Fun and Sun!" literacy camp for children in Baker Lake Nunavut. Pictured here are Queen's student's Patrick Sawtell and Lauren Long.

projects that help expand the potential for development in marginalized communities. The Kenny Foundation has backed a QPID project in Nunavut, but the program has also completed more than 200 other projects in Bolivia, Peru, India, Nicaragua, Peru, Bolivia and Burkina Faso.

One Kenny Foundation project took place in Thunder Bay, where the Kennys funded the establishment of a one-week summer orientation program for 30 Aboriginal high-school students at the Confederation College Aviation Centre to encourage their interest in becoming pilots and mechanics. "The need is there," says Kenny. "There's a northern Ontario airline [Wasaya Airways LP] owned by Aboriginal people that employs 85 pilots, but only one is Aboriginal. That just doesn't seem right."

Though its focus is Canadian Aboriginal communities, the Kenny Foundation also operates in East Africa, where it provides a number of schools in Uganda with a pair of cows – an endeavor that combines agriculture and education and which, not surprisingly, is close to Kenny's heart. Like all other foundation initiatives, it has been developed in close partnership with people in the host community, who are best able to judge local needs.

"This helps to educate the kids and gives them milk for their daily nourishment," says Kenny. "It also encourages the parents to send the girls to school, because otherwise they'd keep them at home working. But if they think they can learn something at school that would help them on the farm, they'll send them. It's been a fairly encouraging program … because education is the key to prosperity."

WHAT'S YOUR STORY?

Help us continue to celebrate the interesting stories of our Engineering and Applied Science alumni!

We want to hear about, and share, more of your experiences since you graduated from Queen's. If you would like to suggest a story about any of our alumni, or share your own, please contact Joanne Grills in the Faculty of Engineering and Applied Science Advancement office. Then watch for these stories on our website and in future editions of *The Complete Engineer.*

Contact: Joanne Grills, 613.533.6000 or 1.800.267.7837, Extension 75248, grillsj@queensu.ca

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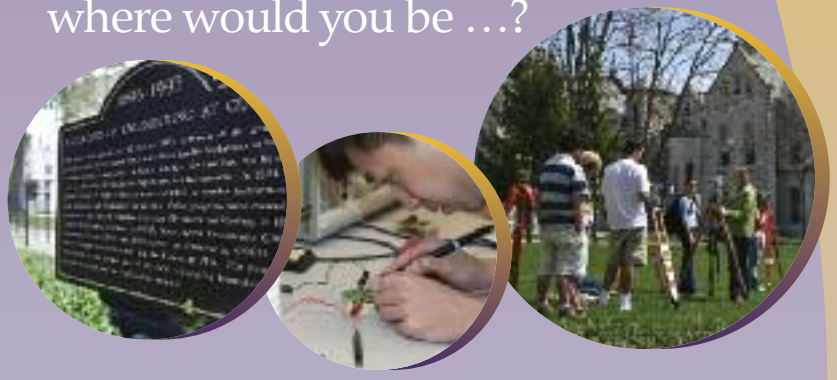

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Join others in providing a distinctive learning experience to our future leaders of the 21st century. There are many ways our alumni and friends can contribute to the present and future excellence of a Queen's Engineering education.

Are you involved in an innovative or unique initiative? Do you have corporate insights that could benefit our students …the leaders of tomorrow? Are you interested in providing support for our innovative programming, the student experience, excellence in teaching and research and/or revitalizing our infrastructure?

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