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U of A Engineer

Celebrating a Century of Engineering Excellence

From Humble Beginnings | Paul Tichelaar Going the Distance | Robert Ritter PhD Pioneer

Message from the Dean

One hundred years ago Alberta was in its infancy and required the skills and talents of engineers to shape the province, tackling everything from ensuring the safety and security of fresh water and crops to the building of roads, sewers and rail lines.

The University of Alberta's first engineering professor, William Muir Edwards, set the standard for our Faculty. Muir Edwards played a crucial role in helping the City of Strathcona to treat its drinking water. Historic records demonstrate that his work was vital in ending typhoid outbreaks being spread by poor water treatment. Muir Edwards died in 1918 caring for the sick during the Spanish flu epidemic. It's a tragic story but also one that describes the calibre of individuals involved in the early days of our engineering programs, and their sense of service to society. This ethic has become a hallmark of the Faculty of Engineering.

This year we celebrate the university's Centenary, 100 years of engineering education, and our 20,000th graduate from the Faculty. Our alumni are unique individuals who have done special things with their lives, having an impact not only on themselves, but also on their families and society. Many have seen the strong foundation their education has provided for them and have seen the way to support the next generation, empowering us to progress even further.

Our alumni have been instrumental in the development of our city, our province, and beyond – helping others around the world to thrive and prosper.

Today, you only need to chat a few minutes with our students to discover they too possess a real sense of service, a desire to help others. That's why we've seen such demand for new program areas such as biomedical engineering, where you can see the direct impact of engineering on the human body. In all of our disciplines, students are saying, "This is the way I would like to make my mark on society and help others."

It is proof that there remains in our Faculty a 'high nobility' that was perhaps best expressed during our earliest days, when our university and Faculty were being established. We still find the same sentiments among our faculty, staff and students today – that desire to build and strengthen our communities. Together, we have made a difference. Together, we continue on the path of service and change.

Yours truly,

David Lynch

David T. Lynch, PhD, P.Eng.
Dean of Engineering

Vision

To be one of the largest and most accomplished engineering teaching and research centres, a leader in North America.

Mission

To prepare top quality engineering professionals, to conduct world-leading research, and to celebrate the first-class reputation and outstanding accomplishments of alumni.

Values

Dedication, integrity, professionalism, and excellence in teaching, research, and service to the global economy and community.

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There can be no better time to join the Faculty of Engineering and to take on editorship of *U of A Engineer* than during the university's centenary — and the 100th anniversary of Engineering at the University of Alberta.

The timing provides a perfect excuse to immerse one's self in the history and proud traditions of the Faculty, to learn the stories of those who have led the way in teaching, research, and community service, the impressive achievements of our alumni, and the exciting potential of today's students and researchers.

As surely as the university and the province sat at the frontier in 1908, we are at a new kind of frontier today. Our students learn at the side of some of the world's best and brightest — professors who are also renowned researchers — using tools and technologies our founders could never have imagined.

The achievements of our alumni — the tremendous impact they've had on society — is testament to the student experience in the Faculty of Engineering. To my newcomer's eye, it appears more and more to me that the common denominators in all the engineering disciplines are an insatiable curiosity and desire to learn, a genuine belief that there are no setbacks – only challenges, and the tenacity to overcome those challenges. Fine qualities indeed.

I have been working with the University of Alberta for the past seven years — and it is indeed an honour to join the Faculty of Engineering. This issue of *U of A Engineer* cannot claim to be a definitive history of our Faculty, but it does provide us with a sense of our past, our present and our future. In my capacity as editor of *U of A Engineer*, I look forward to meeting more alumni, learning of your achievements and sharing the your stories. Yours truly,

Richard Cairney

Richard Cairney
Editor

Letter to the Editor

Welcome in my mailbox anytime

I just received my U of A Engineering Magazine today and had to write you and tell you how much I enjoyed the articles. They were all thoughtfully written and topical. Nice going, and thanks for all your hard work. I do look forward to the next one!

Too bad we missed an issue due to staff shortages, I suppose this is happening everywhere in Alberta these days, since I now have to wait a very long time for my coffee at "Tim's".

I found the mix of technical and personal information in each article made for interesting and informative reading.

Keep up the good work, and thanks again.

Doug Murdoch

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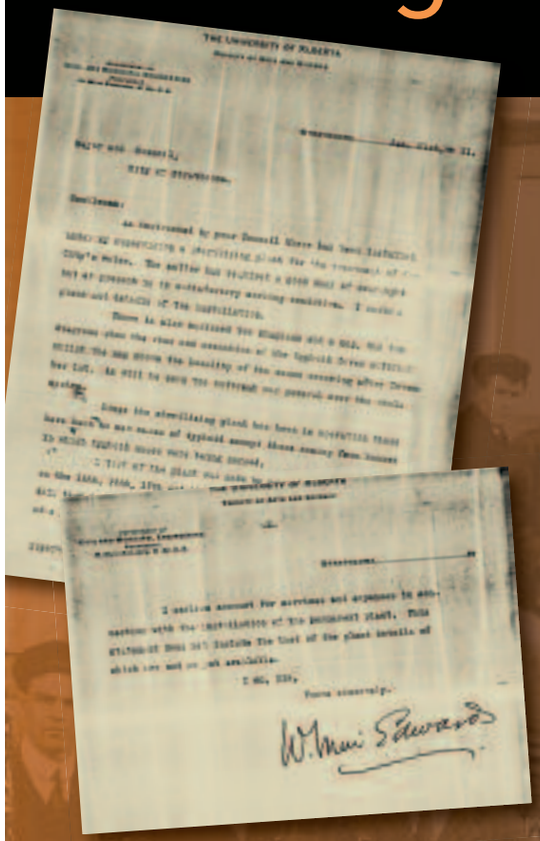
Celebrating a century of engineering excellence

by Richard Cairney



While scouring the U of A archives for historic photographs of the Faculty of Engineering we uncovered a letter from William Muir Edwards, one of the first four professors teaching at the University of Alberta. An engineer, Muir Edwards taught applied science and civil engineering—and served his pioneer community.

In a letter to the mayor and council of the City of Strathcona (in those days, the south side, where the university was located, was still a separate city), Muir Edwards reports that a new water treatment facility has brought an end to water-borne disease afflicting Strathcona's residents.

"Since the sterilizing plant has been in operation there have been no new cases of typhoid except those coming from houses in which typhoid cases were being nursed," he writes.

The letter, dated January 21, 1911, reflects our province in its infancy, and the commitment to community service that lies at the heart of the Faculty of Engineering and Alberta's university. Muir Edwards died November 14, 1918—his thirty-ninth birthday. Pembina Hall had been converted to a hospital during the worldwide Spanish flu epidemic. While tending the sick there, Muir Edwards succumbed to the disease.

It was no accident that, when it opened in 1908, the University of Alberta began educating engineers. Since then, our professors and alumni have had a profound and lasting impact on every aspect of life in our province.

You can read the history of engineering in Alberta—the stories of our engineering alumni and professors—in the roads that criss-cross the Prairie and scale Rocky Mountain passes, in the bridges that span rivers, in the structures that define our communities, even in the comfort and safety of our own homes.

In 1908, five University of Alberta students began their engineering education. Today the Faculty of Engineering ranks in size among the top five percent of more than 400 engineering schools in North America, with about 3,800 undergraduate and 1,200 graduate students. Our province prospers and our university achieves beyond the wildest dreams of its founders.

Learning alongside professors who are internationally renowned for their research, today's students, like those before them, will address society's most pressing needs. They will apply their education and creativity to new challenges in biomedical engineering, nanotechnology, energy and the environment, and information and communications technologies. In doing so they will serve our communities, near and far, following in the footsteps of their predecessors, and blazing new trails for those who will follow them.

The following stories recount some of the history of our Faculty, the achievements of our alumni, and the aspirations of our students. Enjoy.

Civil Engineering

99 years of civil engineering at the U of A

by Bruce White

City of Edmonton Archives/ U of A Creative Services

April 27, 1929 – workers pause during construction of a relief sewer beneath the streets of Edmonton. Fast forward to 2001: Civil Engineering professor Simaan AbouRizk, shown here in a storm relief sewer he acted as consultant on, is awarded the prestigious NSERC Steacie Fellowship for outstanding engineers. AbouRizk holds the NSERC Senior Industrial Research Chair in Construction Engineering and Management.

As the University of Alberta celebrates its 100th birthday in 2008, one of the successes it can justly take pride in is being home to the largest civil engineering school in Canada, and one of the top five in North America, with 800 undergraduate and 400 graduate students.

Today's Department of Civil and Environmental Engineering is the largest of four departments in the Faculty of Engineering. It offers degrees in Petroleum Engineering, Mining Engineering and three flavours of Civil Engineering: General, Environmental and Biomedical. It also enrols more graduate students than any other department on the U of A campus.

It is difficult today to imagine an institution with humbler beginnings than the University of Alberta in 1908. In its first year it was housed in borrowed classrooms in a Strathcona public school with four professors and 45 full- and part-time students. Staff were picked by the U of A's first president, Dr. Henry Marshall Tory, a McGill-trained physicist, mathematician and theologian from Nova Scotia. Dr. Tory had a career like no one else in Canadian learning. Before arriving at the U of A, he helped to found a forerunner of the University of British

Columbia. During the 1914-18 war, he set up "Khaki University" in England, which trained 50,000 Canadian soldiers. After retiring from the U of A he moved to Ottawa, where he was founding president of the National Research Council in 1928 and Carleton University in 1942.

In the U of A's second year, 1909, five students enrolled in the its new Department of Civil and Municipal Engineering. This first class of U of A engineers, who graduated in 1913, was taught by William Muir Edwards, a professor of mathematics and civil engineering who had come west from McGill University in 1908. During the influenza epidemic of 1918, Pembina Hall was pressed into service as an emergency hospital to care for flu-stricken Edmontonians and Prof. Muir Edwards volunteered to help care for patients. He contracted the disease and died at age 39.

Another early-round pick for the university was an electrical engineer from McGill, Dr. Robert William Boyle, a Newfoundlander who was recruited by Dr. Tory in 1912 to head the physics department. During the First World War instruction in engineering was suspended and Dr. Boyle went to Manchester, England, to work on early versions of sonar, which could detect a submarine submerged up to a mile away. Dr. Boyle later became the first head of the Department of Electrical Engineering, the first Dean of Engineering and would move on to a distinguished career at the National Research Council.

Another arrival in 1912 was a New Englander with the magnificent name of Ibrahim Folinsbee Morrison, who was recruited from the civil engineering staff at MIT. Morrison taught the first soil mechanics course at a Canadian university and was remembered by early U of A engineering grads as an inspiring teacher. He consulted on construction of Edmonton's Rossdale power plant and the Ghost Dam on the Bow River west of Calgary.

In 1919 the U of A enjoyed a record enrolment of more than 1,000 students, many of them returning soldiers who had served their country in the First World War. The Department of Civil and Municipal Engineering remained a modest enterprise, giving out fewer than 10 B.Sc degrees per year until the outbreak of the Second World War. New disciplines in engineering were added to the U of A calendar: mining & metallurgical (1914), electrical (1925), and chemical (1928).

The period between the two world wars saw Canadian engineers organize themselves into a self-regulating profession. As a young civil engineering professor, Robert Starr Leigh Wilson was a key figure in the passing of the Alberta Engineering Profession Act of 1920 and served as the first registrar of the Association of Professional Engineers and later its president. A specialist in railway construction, Wilson was dean of the faculty from 1929 to 1946, a watch consisting of the Great Depression followed by the Second World War.

During the depression, the university budget was slashed by a third, staff salaries were repeatedly cut and the work of the Alberta Research Council was suspended. Without adding staff, the number of students in the engineering faculty rose from 260 in 1930 to 300 in 1940.

Robert M. Hardy joined the department in 1930 from the universities of Manitoba, McGill and Michigan and is credited with making the U of A a substantial graduate school for civil engineering. He was a head of the department, dean of engineering and found time to run R.M. Hardy and Associates Ltd., which consulted on highway and airport projects across Canada.

If one wanted to write a sweeping novel of life in the middle of the 20th century, one could find worse models than Leonard Gads. He was born in 1907 to wealthy Russian parents who fled to China after the revolution. His father died and he ended up driving a cab in the Manchurian city of Harbin to support his family. He came to Canada at the age of 19 and was an overworked farm labourer in the Wetaskiwin area for 10 years until he saved up enough money to enroll in civil engineering at the U of A, graduating in 1939. During the Second World War, Gads taught navigation to Royal Canadian Air Force and Commonwealth recruits and after the war served as an interpreter with the allied occupying force in Berlin. Hardy brought him back to the U of A to take on a teaching load that included surveying, astronomy, graphics and an orientation course on about the engineering profession. He retired in 1971 as an associate dean.

In 1948, petroleum engineering was added as a new discipline in the Faculty, and the dis-

City of Edmonton Archives/ U of A Creative Services

timeline

History of Civil Engineering

1887 Canadian Society for Civil Engineering founded.

1908 University of Alberta opens with 45 students and four professors.

1909 Department of Civil and Municipal Engineering is created. William Muir Edwards is the U of A's first engineering professor.

1913 First graduating class of five engineers.

1915 Construction of the Civil Engineering Building (South Lab).

1918 Prof. Muir Edwards dies, a victim of worldwide influenza.

1953 Civil Engineering Building completed.

1956 U of A establishes Canada's first graduate program in civil engineering.

1980 Professorship established in construction engineering.

1981 Faculty of Engineering introduces co-op study.

1983 Centre for Frontier Engineering Research established.

1994 Establishment of C.W. Carry Chair in Steel Structures.

1995 B.Sc in Civil Environmental option offered.

2002 A $5-million donation from the Hole family, whose construction company Lockerbie and Hole traces its roots back to 1898, creates the Hole School of Construction Engineering.

2004 The $65 million Allan P. Markin/Canadian Natural Resources Limited Natural Resources Engineering Facility (NREF) opens.

2007 Civil biomedical option degree introduced.

A leading expert in cold-climate engineering, civil engineering professor Dave Sego conducts research in a cold lab at the Canadian Centre for Frontier Engineering Research.

U of A Creative Services

covery of oil near Leduc set the course for post-war Alberta. In the 1950s and 1960s, the U of A sent numerous civil engineering graduates to major engineering schools in the U.S. and Great Britain for doctoral studies, including Illinois, Berkeley, Lehigh and Birmingham. Many returned to join the U of A faculty and became the backbone of the department in the 1970s and 1980s.

Others came to the U of A to escape troubles in other parts of the world. At least three professors arrived from Czechoslovakia after the 1968 uprising, including Stan Tepley (who specialized in urban transportation), Eva Knetting (environmental engineering) and Zdenek Eisenstein (tunnelling).

The opening of the I.F. Morrison Structural Engineering Laboratory in the 1960s gave the department the ability to test large concrete, steel timber and masonry structures as well as advanced materials. It also opened to door to research into ways to assess, repair and extend the lifespan of existing structures instead of costly replacement.

By the late 1980s, the department could claim leadership in several fields of research. Dr. James MacGregor was a world-recognized expert in reinforced concrete structures, while Dr. Norbert Morgenstern was a geotechnical engineer with a specialty in slope stability. Both have retired from the university with honorary doctorates. Other leading department members included: Dr. David Murray in structural engineering, Drs. Don Scott and Eisenstein in geotechnical engineering, Dr. Nallamuthu Rajaratnam in water resources and Dr. Daniel Smith in environmental engineering.

The 1980s and early 1990s were a time of retrenchment. There were fewer students due to quotas and waves of cost-cutting culminating in Premier Ralph Klein's across-the-board cutbacks in 1993. The influx of teaching and research talent dried to a trickle. Of the handful of staff hired in this period, most went on to successful careers that continue today.

Dr. David Sego, who received his PhD from the U of A in 1980, is a world leader in building structures on permafrost. Dr. Simaan M. AbouRizk holds three research chairs and is a professor in the Construction Engineering Management program, which was established in the department in by Prof. S. Peter Dozzi in the 1980s.

Dr. Roger Cheng began his engineering education in Taiwan and arrived from the University of Texas in 1984. In 1997 he became the second holder of the C.W. Carry Chair in Steel Structures, which through the generosity of an Edmonton steel fabricator became the first fully endowed chair in the U of A Faculty of Engineering. Dr. Cheng became chair of the Department of Civil and Environmental Engineering in 2002.

The 1980s and early 1990s saw many dramatic changes. The introduction of a co-op learning program in the Faculty of Engineering in 1981 gave students two benefits they couldn't find in a classroom or lab: real-world experience and a regular paycheque. Currently, 45 to 50 per cent of civil engineering students are in the co-op program.

Civil engineering students at the end of the 1980s were able to observe the biggest civil construction projects of the period virtually under their feet: the extension of Edmonton's LRT system across the river to the University station. Regular tours of the various worksites were arranged for the students. Of particular interest was the new bridge named after an early U of A civil engineering grad and former city commissioner Dudley B. Menzies. Completed in 1990 at a modest cost of $13.3 million, the LRT and footbridge were constructed of 216 precast concrete girders each 2.5 metres long and held together by 253 km of high-strength, post-tensioned steel cable.

Without fanfare, and despite an unsuccessful attempt to impose quotas on foreign students, the department acquired an international flavour. By 1990-91, only 38.8 per cent of graduate students in civil engineering were from Canada: nearly as many came from Asia and one in seven were from Africa.

But the dismal science of economics took its toll. By 1991, a hiring freeze was imposed, travel budgets were slashed and even the department's allocation to buy journals was cut by $10,549. The faculty's enrollment quota was ratcheted down. It was decided in 1991 to terminate the mining engineering program, which had been a pillar of the engineering faculty since 1914. However, the mining industry and the Alberta Chamber of Resources rallied to deliver funding for professorships and save the program. That resulted in a series of hires in the mid-1990s, including Dr. Clayton Deutsch, from Stanford University, who teaches graduate courses in geostatics and heads the U of A School of Mining and Petroleum Engineering.

A reorganization of the faculty in 1996 brought another major change to Civil Engineering: the addition of the environmental, petroleum and mining units to the department. A fifth discipline of biomedical engineering has since been added, across the Faculty.

In the decade leading up to the University of Alberta's centennial, rising prosperity and surging enrolment have enabled the department to recruit people to branch into new areas and build on the legacy of previous generations. New buildings in the engineering complex on campus attest to the resurgence of the faculty. Growing enrolments, funding and sponsored research have allowed the Department of Civil and Environmental Engineering to build on its strengths in geotechnical and structural engineering and to spread into other areas as well. The result is a more balanced, well-rounded department, says Chairman Dr. Roger Cheng.

Civil engineers use new technologies to solve new problems, and old problems, too. That could mean applying materials created in a nanotechnology lab to the treatment of wastewater, or finding ways to extract and clean water from tailings ponds to reduce the water consumed in resource extraction. As the gas industry begins to exploit coal bed methane, more challenges arise for civil and petroleum engineers: dealing with wastewater, CO_2 sequestration and producing the gas.

Dr. Cheng wants us to break through our stereotyped thinking and put civil engineers in leadership positions in all kinds of fields; some traditional but others quite surprising.

Nanotechnology will have an impact in unexpected places, including Alberta's poplar forests. Nanotechnology can be applied to wood fibre to strengthen it for use in value-added wood products such as engineered joists.

Dr. Cheng wants us to break through our stereotyped thinking and put civil engineers in leadership positions in all kinds of fields, some traditional but others quite surprising. In its five-year plan the department focuses on infrastructure engineering, and management, cold climate engineering and natural resource engineering. But civil engineers will become involved with biomedical engineering as well. A bone, after all, is a structural element. The flow of blood through our bodies can be expressed in terms of fluid mechanics. The strains on our knees when we run are due to friction and wear, so there are structural engineers who specialize in knee joints.

Dr. Cheng believes opportunities for future civil engineers are greater than ever. Their training as problem solvers and ability to work in multi-disciplinary teams will equip them for the pressing environmental and social challenges of the 21st century: infrastructure deficit, water quality, air quality, greenhouse gas and the building of cities for the future that are sustainable, healthy and livable. Just as Dr. Tory and Prof. Muir Edwards had intended.

(An excellent history of the first 80 years of engineering studies at the U of A can be found in Dr. George Ford's 1988 book, *Sons of Martha: University of Alberta Faculty of Engineering 1913-1988*.)

Notable people in Civil Engineering

Robert William Boyle — Physicist hired by U of A in 1912, an early sonar researcher, the first head of the Department of Electrical Engineering and the first Dean of Engineering.

William Muir Edwards — One of the original four faculty members at the U of A in 1908, Edwards was a professor of mathematics and civil engineering. He died after selflessly caring for the sick during the influenza epidemic of 1918.

Zdenek Eisenstein — An expert on tunneling who was voted best teacher in the Faculty of Engineering for 1992, Dan Eisenstein consulted on the English Channel Tunnel.

Leonard Gads — A refugee of the Russian Revolution who came to Alberta at the age of 19. Worked as a farm labourer for 10 years to save up enough money to study engineering at the U of A. He retired in 1971 as an associate dean.

Norbert R. Morgenstern — Headed the geotechnical program in the 1980s and consulted on dozens of major projects around the world. Chair, 1994-97; University Professor; honorary doctoral degree 2007.

Ibrahim Folinsbee Morrison — Taught the first classes in soil mechanics in a Canadian university and consulted on a number of Alberta hydro dam projects in the 1920s and 1930s.

David Sego — Received PhD from U of A in 1980 and joined the department's geotechnical program. A leading global expert on cold-climate engineering.

Robert William Boyle

William Muir Edwards

Leonard Gads

Ibrahim Foilnsbee Morrison

Electrical and Computer Engineering

eyes on the prize

by Bruce White

The opening of the Alberta Microelectronics Centre in 1982 proved a milestone in the development of today's Department of Electrical and Computer Engineering. It marked a big step in the department's evolution from a teaching unit to a leader in research.

The centre quickly became a magnet for researchers and microchip designers from across Canada. It served as the launching pad for a renowned Edmonton microdevice fabrication company that now employs more than 150 people. And it created a community of expertise that, two decades later, made it possible for the University of Alberta to become the home of the National Institute for Nanotechnology.

But the birth of the Alberta Microelectronics Centre required political brinkmanship worthy of a Cold War missile treaty negotiation. In fact, when the federal government decided in the early 1980s to invest $1 million each in three research centres across Canada, it hadn't even considered the U of A, recalls Dr. C.R. (Bob) James, chair of electrical engineering at the time. The U of A found out about the plan only days before an announcement was to be made.

James immediately telephoned a senior research bureaucrat in Ottawa and gave him an earful: "Don't you realize that we have the third-largest electrical engineering department in the country?" Furthermore, the U of A met every criterion the federal industry department had set for the centres (except perhaps an unwritten requirement of being located in a riding represented by a Liberal MP).

The bureaucrat informed James that he had been planning to hand his recommendations the next day to Herb Gray, the senior minister in Pierre Trudeau's cabinet who would make the decision. However, he said, Gray was suffering from the flu and might need to delay the decision.

James rushed a 40-page brief to Ottawa and, before long, found himself at the airport greeting a delegation sent, ostensibly, to evaluate the U of A bid. James drove his guests to a downtown hotel, and they sat down in the lounge together for drinks. Over a round of beers, the guests admitted that, in reality, they had been sent to break the bad news. While the higher-ups in Industry, Trade and Commerce were impressed with the proposal, this wasn't going to be the U of A's turn.

James refused to take no for an answer. Presentations went ahead the next day, and James told faculty members to punch hard and heavy. They hammered away all day and didn't stop until 6:30. Even then, with the feds pleading for mercy, James didn't let up. At a banquet in the Faculty Club, James proposed a toast: "To the Alberta Microelectronics Centre." The U of A profs stood and raised their glasses, while the visitors sat frozen at their places.

James kept the pressure on, lining up a meeting with Gray and persuading him to expand the list to six universities. The U of A got $200,000 a year for five years to get into the high-tech business of microelectronics.

Dr. Clarence Capjack, who a decade later would chair Computer and Electrical Engineering, believes James succeeded not only because of his political toughness, but because of his ability to involve other people

Today's electrical and computer engineering students learn using state-of-the-art technology.

in his projects. James had the ear of his MLA, Neil Crawford, and other ministers in the government of Peter Lougheed, which was eager to diversify the Alberta economy. That relationship was highlighted in 1983 when Lougheed cut the ribbon on a new lab dedicated to CAD/CAM (computer-aided design/computer-aided manufacturing).

The Alberta Microelectronics Centre was quickly followed by other successes. The Alberta Laser Institute opened in 1985, building on laser and plasma research begun two decades earlier by Dr. George Walker. The Alberta Telecommunications Research

U of A Archives

Electrical engineering class of 1942. With the Second World War raging, the department taught short courses in radio electronics to hundreds of RCAF personnel.

Centre opened the following year, the culmination of years of discussions that had begun with the concept of a western outpost of the Bell Northern Research Lab. Any way you measure it, James was on a winning streak.

Early days

Research in electrical engineering at the University of Alberta traces its roots to the dawn of the 20th century and the remarkable career of R.W. ("Billy") Boyle. A Newfoundland native, Boyle excelled at McGill University, where he was the first student to receive a PhD in physics. In 1912, another McGill man—Henry Marshall Tory, the founding president of the U of A—lured Boyle to Alberta to head the physics department, which offered an electrical engineering course.

During the First World War, Boyle worked for the British Admiralty researching asdic, an early sonar technology that could detect a submarine under water up to a mile away. He became the Dean of the Faculty of Applied Science in 1921. By 1925 he created a separate Electrical Engineering department, which started out with a dozen third- and fourth-year students each term. Soon afterwards Boyle departed for Ottawa to rejoin Tory, by then the founding head of the National Research Council.

One early U of A specialist in electronics and communications was Ward Porteous, a former lab boy in the physics department who went on to receive the U of A's first Master's in Electrical Engineering. Porteous joined the department staff in 1931, a year when it had seven graduates. He helped build the original CKUA radio transmitter on campus, and wired CKUA into Canada's first educational radio network. During the Second World War, he conducted classified research into antennas and taught electronics courses for the Canadian military. His teaching career at the U of A continued into the 1970s.

Between 1939 and 1945, the department ramped up production, graduating about 60 electrical engineers per year by war's end. Perhaps more importantly, it taught short courses in radio and electronics to hundreds of Royal Canadian Air Force personnel at a time. After the war, enrolment in the department gradually declined until 1958, when Calgary Power's gift of a Brown-Boveri Network Analyzer gave the U of A a national advantage in the field of power research. That, in turn, attracted students with an interest in power engineering.

Good times in the '60s

Capjack, a 1962 grad who would be the department chair a generation later, remembers a department where research, by necessity, took a back seat to teaching: "It was different department then, and with a very small faculty they taught a great number of students. The teaching loads they had then were very, very large."

The Beatles were live in black and white on televisions packed with vacuum tubes when George Walker became head of the department in 1964. Electrical engineering had 113 students and 10 staff that year, but

timeline

History of Electrical Engineering

1912 Dr. Robert William Boyle becomes head of the physics department.

1925 Department of Electrical Engineering is created; Boyle named chair.

1930 CKUA joins first cross-Canada educational radio network.

1931 Ward Porteous joins the department; earns its first M.Sc. in electrical engineering in 1933.

1941 Department begins to give special courses in electronics for naval and air force personnel.

1958 Calgary Power donates a Brown-Boveri Network Analyzer to stimulate utility research.

1964 Dr. G.B. Walker becomes department head.

1972 Nine faculty members receive a $638,000 grant for the development of laser and plasma physics.

1974 C.R. ("Bob") James becomes department chair.

1982 Dr. Alberta Microelectronics Centre is established (now Micralyne Inc.).

1985 Alberta Laser Institute is established.

1986 Alberta Telecommunications Research Centre is established (now TRLabs).

1987 Dr. P.R. Smy becomes chair.

1992 Dr. Clarence Capjack becomes chair.

2002 Electrical and Computer Engineering Research Facility (ECERF) opens; boasts the most advanced clean room in any Canadian university.

2004 Dr. Horacio Jose Marquez becomes department chair.

2008 U of A electrical engineers and biologists demonstrate a medical laser capable of operating on a single human cell.

the numbers grew quickly. Every university in North America was expanding rapidly, and new institutions such as the University of Calgary (est. 1966) were being created for the first baby boomers.

By 1969, Walker had grown his department to 23 professors and three post-doctoral fellows. This influx of newcomers reawakened the department as a research unit. In 1972, Walker negotiated a $638,000 development grant for laser and plasma physics. That helped establish a group in the department (including J. Tulip, H.J.J. Seguin, P.R. Smy, A.A. Offenberger and Capjack) that earned an international reputation for pushing lasers from the lab into industrial and medical applications.

As research investment increased through the 1980s, students benefited greatly from the expertise of their instructors. "It's not somebody who has picked up a textbook that's six or seven years old," Capjack explains. "Students get the material from someone who is at the leading edge of that world." A great example, he says, is Dr. Fred Vermeulen, a very good researcher in electromagnetics, a passionate and well-liked teacher and, in recent years, a mentor to a new generation of professors.

The University of Alberta, in its centennial year, has Western Canada's largest computer and electrical engineering department, independently ranked as one of the top three departments nationally with Waterloo and Toronto.

Tearing down then rebuilding

The era of Walker, James and Smy, from 1964 to 1992 marked nearly three decades of almost uninterrupted growth and progress. However, a short, sharp shock followed in the 1990s. Almost as soon as Capjack took over as head of the department, he had to find a way to absorb a 20-per-cent-plus budget cut without decreasing the number of students. Many faculty recruits from the 1960s accepted early retirement in 1994–95, and ranks of part-timers grew to 25 sessional instructors, including more than a few who never completed their term. Capjack remembers having to plead with a professor emeritus, Keith Stromsmoe, to hurry back and take over a microcircuit design course after its instructor bolted. The department also implemented other forms of cutbacks, including reducing the number of research groups from 13 to 6.

Eventually, however, funding began to flow back into the engineering faculty, and the department returned to recruitment mode. By the mid-1990s, competition for talent was fierce, not only from other academic institutions, but from a booming high-tech sector. Canada's 60-cent dollar put the U of A at an even greater disadvantage. Faculty candidates were wooed aggressively—met at the airport and driven around town to check out the real estate market and schools for the kids.

Among the new hires in this period was Dr. Horacio Marquez, an Argentine-born electrical engineer specializing in control systems. Marquez arrived in 1996 from a post-doctoral position at the University of Victoria. Like his predecessors a generation earlier, he came to a department that carried a heavy teaching load at the expense of research. That changed virtually overnight, as computers sprouted from every desk and the Internet evolved from an academic network to a mass-market phenomenon.

The Alberta government-sponsored Informatics Circle of Research Excellence (iCORE), established in 1999, endowed a number of research chairs and funded IT research along with Alberta Ingenuity. The federal government sponsored five Canada Research Chairs in the department. New buildings were planned for the Faculty of Engineering—including the Electrical and Computer Engineering Research Facility that opened in 2002.

Marquez became department chair in 2004, eight years after arriving. During that time, the department had grown from 26 faculty members to 52—with a goal to expand to more than 70 members in coming years. The University of Alberta, in its centennial year, has Western Canada's largest computer and electrical engineering department, independently ranked as one of the top three departments nationally with Waterloo and Toronto. Marquez plans to expand electrical engineering to make the department the largest in Canada. But Marquez says size isn't his number-one concern. He's more interested in adding breadth and depth to the department to make it one of the best in North America.

The department has strength in traditional areas of communications, power systems, electronics, signal processing, control systems and electromagnetics. Marquez sees four principal areas of growth:

1. Information-Communications Technology (ICT)—Consisting of communications and all its enabling technologies such as electronics, signal processing and software engineering.
2. Biomedical engineering—An undergraduate biomedical option in electrical engineering created two years ago provides students with an alternative to general sciences as a route into medical school.
3. Nanotechnology—A growing ability to manipulate materials at nanoscale is opening great new opportunities for electrical engineers. Microelectromechanical systems (MEMS) are already established in the marketplace. Even smaller and more complex nanoelectromechanical systems (NEMS) are on the way.
4. Energy systems—The focus is shifting from traditional power systems to new energy systems such as solar and wind. A solar panel, for example, is engineered from nanomaterials and electronics.

The relatively modest investment Bob James secured back in the 1980s has generated fantastic payoff. The lineage is direct and unmistakable.

The microelectronics lab evolved into a well-equipped, ultra-clean nanofabrication facility unique in Canada, which continues to attract researchers from across the country. A company successfully spun off from the centre in 1998, Micralyne Inc., is one of the world's largest independent microelectromechanical systems (MEMS) foundries. Research in MEMS, microfluidics, and thin-film technologies, among other areas, contributed to the decision in 2001 to bring the National Institute of Nanotechnology to the U of A.

The Alberta Laser Institute was the fore-

runner of MPB Lasertech Inc., which provides laser cutting for Alberta industries. The institute also pioneered medical and other applications for lasers.

The telecommunications centre worked with major telecom industry partners on self-healing networks, which route data around communication failures. The centre continues as TRLabs, a consortium of five prairie universities.

These ongoing investments also are delivering real-world technologies. Thin-film coatings make drill-bits harder and solar cells more efficient at generating electricity. Lab-on-a-chip devices, already in use, pass a patient's simple blood sample through microfluidic channels where the DNA is manipulated and analyzed to determine if it contains genes related to cancer. Then, the tiny throwaway device exports the test results to a desktop computer in the doctor's office.

And we can expect more in the near future. It's amazing what happens when a hard-nosed group of engineers refuses to take no for an answer.

Notable people
in Electrical and Computer Engineering

Masoud Ardakani—Currently an assistant professor, an Ingenuity New Faculty Member and holder of an iCORE Junior Research Chair in the Wireless Communications Laboratory (iWCL).

Norman Beaulieu—A leading researcher in wireless communications, Beaulieu is iCORE Research Chair and a NSERC E.W.R. Steacie Memorial Fellow. He is the first electrical engineer to have received the K. Y. Lo Medal from the Engineering Institute of Canada.

R.W. Boyle—Hired by Henry Marshall Tory in 1912 as head of the physics department, "Billy" Boyle helped develop sonar in the First World War, became Dean of the Faculty of Applied Science in 1921 and created the Electrical Engineering department in 1925.

Michael Brett—A leader in nanotechnology at the U of A, Brett was instrumental in the creation of the NanoFab lab, which develops nanotechnology applications and microdevices. He is an iCORE professor in nanotechnology, holds the Micralyne/NSERC Senior Industrial Research Chair and was the 2002 Canada Research Chair in Nanoengineered Thin Films. He received APEGGA's Excellence in Education Award, the university's Rutherford award for excellence in teaching, and the 2007 University Cup—the highest honour the U of A can bestow on a member of its academic staff.

Clarence Capjack—Chair of the department in the turbulent 1990s, Capjack focused on laser and plasma research.

Abdulhakem Elezzabi—A present-day example of a leading researcher who also is an excellent teacher, Elezzabi holds the Canada Research Chair in Ultrafast Photonics and Nano-Optics.

C.R. (Bob) James—A department chair in the '70s and '80s, James built relationships with government and industry that laid the foundation for the department's growth into a centre for advanced research.

Ward Porteus—The U of A's first student to earn a Master's degree in Electrical Engineering, Ward Porteous joined the department staff in 1931. Porteous helped build the original CKUA radio transmitter on campus and conducted classified wartime research. His teaching career at the U of A continued into the 1970s.

Peter Smy—A winner of the university's Rutherford Award for Excellence in Undergraduate Teaching, Smy was an accomplished researcher in the plasma area and, as department chair, presided over a period of relative stability.

Mani Vaidyanathan—This year, Vaidyanathan, who teaches courses in circuits, electronics and nanoelectronics, became the first recipient of the Provost's Award for Early Achievement of Excellence in Undergraduate Teaching. Vaidyanathan's research interests include carbon nanotubes and nanodevices.

Fred Vermeulen—Now a professor emeritus, Vermeulen was a renowned and impeccably well-prepared communicator in the classroom. His numerous awards include 3M Canada Teaching Fellow, the university's Rutherford Award for Excellence in Undergraduate Teaching and the Canadian Council for Professional Engineers' Medal for Distinction in Engineering Education. Many of the current generation of faculty look to him fondly as a mentor.

George Walker — A department chair—and builder—who in the 1960s recruited many excellent teachers including Vermeulen, James and Smy. Walker steered the department into new areas such as lasers and plasma research.


J.W. Porteus


Norman Beaulieu


R.W. Boyle


Michael Brett

Chemical and Materials Engineering

Laying the Foundation Engineering the Future

by Bruce White and Aimee Maxfield

From the pioneering oil sands research in the 1920s to the ongoing work in thermodynamics and surface sciences, U of A engineers have played a huge role in Alberta's economy.

From year one the mission of the University of Alberta was building a prosperous Alberta, and members of the Department of Chemical and Materials Engineering have pursued this goal into the present. The university's founding president, Dr. Henry Marshall Tory, was a physicist with a zeal for applied research. Tory was authorized to conduct scientific research to support development of Alberta's natural resources, and engineering was an early part of his strategy.

The Department of Civil and Municipal Engineering was launched in 1909, followed in 1920 by the creation of the Department of Mining Engineering. The Department of Chemical and Materials Engineering is the result of a 1996 merger of the Department of Chemical Engineering, founded in 1946, with elements of the former Department of Mining Engineering.

Chemical and Materials Engineering and its earlier incarnations excelled through the decades in diverse disciplines, including the following:

- Oil sands research, as pioneered in the 1920s by Karl A. Clark.
- Thermodynamics, as explored by Donald B. Robinson, Ding-Yu Peng, Fred Otto and Alan Mather from the 1940s through to the 1960s.
- Computer process control, as pioneered in the 1960s by R.A. Ritter and Grant Fisher.

Today, the department has an international reputation for cutting-edge research and excellence in education. Its specialties lie broadly within energy and natural resources, surface and interfacial sciences, nano and regenerative medicine, process control and systems engineering, and advanced materials. The department commits substantial resources to education and student support and receives an enormous amount of funding from industrial partners and various levels of government for its research efforts.

The Genesis of Chemical and Materials Engineering

Although Alberta in the 1920s remained firmly in the age of coal, it was a decade of technological transition. The mass production of automobiles created a boom in road and bridge building, and northern Alberta's bitumen deposits were initially developed for surfacing roads, rather than for fuelling automobiles.

Karl A. Clark headed the Mining and Metallurgy department for nine years, investigated methods of separating bitumen from sand in 1920, and found success on a small scale in 1923 and in larger pilot plants built in 1930 and 1949. In retirement, Clark consulted on the building of Alberta's first commercial synthetic oil plant, the Great Canadian Oil Sands (now Suncor) in Fort McMurray, which began commercial production in 1967.

The U of A hired its first chemical engineer, E. H. Boomer, in 1925. Boomer laid the groundwork for the Department of Chemical Engineering (created in 1946), although he died before the department became a reality.

Karl Clark, known as the father of the oil sands, first pioneered ways to coax oil from sand during the 1920. Today, professor Murray Gray, seen here with graduate students Negin Razavilar and Greg Dechaine, is pioneering breakthrough technologies for clean oil sands energy at the Imperial Oil-Alberta Ingenuity Centre for Oil Sands Innovation.

Depression and wartime

In 1930, the Department of Mining Engineering was renamed "Mining and Metallurgy." By the end of the decade, M & M had the highest enrolment of all the engineering disciplines—even in the depths of the Great Depression, there were jobs for mining engineers.

In 1939, with Canada at war, engineering talent was in urgent demand. Boomer became an advisor to Canada's munitions program and directed research projects for the Directorate of Chemical Warfare and Smoke. In 1943, Boomer became chairman of the Alberta Oil and Gas Conservation Board. After the end of the Second World War he travelled to Europe to study occupied Germany's synthetic fuel industry. He returned to the U of A as the sole professor in the Chemical Engineering program.

In 1945, enrolment surged, and Mining and Metallurgy went through a transformation in both name and numbers. By 1946, the Chemical Engineering program was in full force, and grads found eager employers in the oil patch following the discovery of oil near Leduc in 1947.

The fledgling Department of Chemical Engineering responded rapidly to the growth of the region's oil and gas industry. By 1948 it was hosting a "mud school" for oil drillers, and was offering a degree in petroleum engineering.

The postwar era

Chemical Engineering in the early 1950s was a small department; 12 students graduated in 1953. That elite group found itself in demand, as the Edmonton area was immersed in its first oil boom. Demand also grew for metallurgists with the building of the Sherritt Gordon nickel refinery near Fort Saskatchewan in 1954 and Premier Steel Mills in Edmonton in 1955. Oil, gas and petrochemicals presented opportunities for research into practical problems.

During this period, George W. Govier was both dean of Engineering and a member of the Alberta's Oil and Gas Conservation Board. He later wrote the seminal 1972 textbook, *The Flow of Complex Mixtures in Pipes.*

Another prominent figure of the period, Donald B. Robinson, founder of the engineering powerhouse D.B. Robinson and Associates, was not only a researcher and department head, but also a teacher beloved by his students for his ability to make complex material understandable. He became world-renowned as co-developer (along with Ding-Yu Peng) of the equation of state used to calculate vapour-liquid equilibrium of mixtures of hydrocarbons and gases. The Peng-Robinson equation, as it came to be known, is used widely in the petroleum and petrochemical industries, and forms an integral part of most modern chemical engineering thermodynamics texts.

U of A's chemical engineers, including Grant Fisher, also pioneered computer process control. The purchase of Canada's real-time, sensor-based IBM 1800 computer—installed in the new Chemical Engineering Building in 1967—gave engineering students experience on systems that even their potential employers didn't yet have.

The 1980s and 90s

In 1983, the introduction of a co-op learning program in Chemical and Materials Engineering transformed the traditional linear student path from high school to university to job market. It gave students the opportunity to blend real-world experience with academic learning—while earning a paycheque. For the department, co-op educationmeant adopting a full three-term year in place of the more traditional fall-winter terms.

In 1986 the world price of oil dropped by 46 percent, with significant economic and industrial repercussions across Canada. In Alberta, career opportunities for graduates of Chemical Engineering dropped considerably.

In 1992, massive cost-cutting was initiated throughout provincially funded departments and agencies. The U of A was forced to endure a 21-percent grant cut, prompting four Chemical Engineering professors to accept offers of early retirement. Sieg Wanke, who chaired the department from 1985 to 1990 and 1993 to 2002, had to balance fewer faculty members with demands for more research. The department somehow managed to reduce teaching loads, even against the pressure of cutbacks.

In 1996, the department began a process of fiscal resurgence. It aggressively sought

timeline

History of Chemical and Materials Engineering

1946 Department of Chemical Engineering established.

1948 Dr. G. W. Govier named head of Chemical Engineering.

1959 Dr. G. W. Govier becomes dean of Engineering; Dr. D. B. Robinson becomes head of Chemical Engineering.

1967 Department of Chemical & Petroleum Engineering installs one of the first three IBM 1800 computers in Canada.

1972 Dr. D.G. Fisher is named department chair.

1975 Dr. F. D. Otto becomes chair of department.

1976 Dr. D. B. Robinson and Dr. D-Y. Peng publish the Peng-Robinson Equation of State.

1985 Dr. F. D. Otto becomes dean of Engineering, Dr. S. E. Wanke becomes department chair.

1986 The Chemical Engineering program offers an option in computer process control.

1990 Dr. M. R. Gray becomes department chair.

1993 Dr. S. E. Wanke becomes department chair.

1995 Dr. D. T. Lynch, a Chemical Engineering professor, is named dean of Engineering.

1996 Creation of Department of Chemical & Materials Engineering with the merger of the chemical and materials programs.

2002 Dr. J. F. Forbes named department chair.

2005 Alberta Centre for Surface Engineering and Science opens.

2007 Imperial Oil-Alberta Ingenuity Centre for Oil Sands Innovation

(COSI) established.

2008 Dr. U.T. Sundararaj receives national award for excellence in teaching – the Medal for Distinction in Engineering Education from Engineers Canada.

new funding, particularly from corporate and federal government sources. There was a pressing industrial need for research to support heavy oil and bitumen production, with a second wave of oil sands development on the horizon and with corporations scaling back in-house research and development. Syncrude, the Natural Sciences and Engineering Research Council of Canada (NSERC), and Imperial Oil were among the many companies and organizations to fund new research chairs. These chairs proved very successful—each chair in the department was renewed at the end of its initial five-year term.

In 1996, the Faculty of Engineering was reorganized into four departments: Chemical and Materials, Civil and Environmental,

Department of Chemical and Materials Engineering Chair Dr. Fraser Forbes.

Electrical and Computer, and Mechanical. The School of Mining and Petroleum Engineering moved to the Department of Civil and Environmental Engineering, but oil sands and metallurgy fell under the umbrella of the newly named Department of Chemical and Materials Engineering. The combination of materials engineering and chemical engineering was logical, as both disciplines use similar methods to explore changes on molecular surfaces.

The Present, and Beyond

A dozen years after its creation, the Department of Chemical and Materials Engineering now boasts 614 undergraduate students, 227 graduate students, and 54 faculty members. The department is among the U of A's leaders in research. Its graduates are sought after by industry leaders in chemical and materials engineering.

The Department of Chemical and Materials Engineering holds eight NSERC Industrial Research Chairs (Canada's most prestigious research program), more than any University of Alberta department and more than most other major universities in

Notable people in Chemical and Materials

E.H. Boomer — Joined the U of A as a lecturer in 1925, advancing to a full professorship in Physical Chemistry and Chemical Engineering by 1943. Boomer was instrumental in the developing what would become (in 1946) the Department of Chemical Engineering.

Robert Burrell — In June 2008, the World Union of Wound Healing Societies Congress awarded Burrell a lifetime achievement award for his development of the Acticoat bandage, one of the world's first commercial medical applications of nanotechnology. Burrell holds the Canada Research Chair in Nanostructured Biomaterials.

Ken Cadien — Is a recent recipient of a Canada Research Chair in Nanofabrication. Prior to joining the University of Alberta, Cadien was honoured as an Intel Fellow—one of only 12 in the world—for his stellar technical contributions and deft leadership. His research interests include nanotechnology, atomic layer deposition, semiconductor processing at nanoscale dimensions, electronic materials nanotechnology, atomic layer deposition, semiconductor processing at nanoscale dimensions, and electronic materials.

Karl A. Clark — Known as the "Father of the Oil Sands" Clark joined the U of A Department of Industrial Research as a professor in 1920. He taught in Mining and Metallurgy, becoming head of that department in 1945.

Janet Elliott — In 2002, Elliot received the Canadian Institute for Advanced Research Young Explorer's Prize, an award given to Canada's top 20 researchers under the age of 40 in engineering or science. Elliott holds the Canada Research Chair in Interfacial Thermodynamics.

Grant Fisher — Pioneered the area of process control in automation (along with R.A. Ritter), generating international attention and acclaim. He joined the Department of Chemical Engineering in 1964 and was chair of the department from 1972 to 1975.

George W. Govier — Was head of the department from 1948 to 1959, then dean of Engineering for four years. Govier's legacy includes an Order of Canada and a research centre named in his honour at the Alberta Research Council.

Murray Gray — Scientific director of the Imperial Oil-Alberta Ingenuity Centre for Oil Sands Innovation, Gray is an internationally recognized expert on bitumen upgrading. He holds the NSERC Chair in Oil Sands Upgrading and the Canada Research Chair in Oil Sands Upgrading.

Steve Kuznicki — Is the Canada Research Chair in Molecular Sieve Nanomaterials, holds an NSERC Industrial Research Chair in New Microporous Molecular Sieves, and has been named Alberta Ingenuity Fund Scholar.

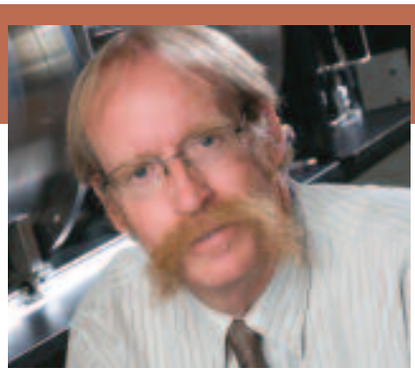
E.O. Lilge — In 1936, while at work on his master's thesis on the use of cyanide leaching in recovering gold from ores found around Lake Athabasca, Ewald Oscar Lilge joined the Department of Mining and Metallurgy. He would go on to head the department from 1954 to 1969.

Jacob Masliyah, OC — Was made a Fellow of both the Royal Society of Canada (1996) and the Canadian Academy of Engineering (2000) in recognition of his research, and

Canada. Faculty members currently holding NSERC chairs include Drs. Murray Gray, Steve Kuznicki, Jacob Masliyah, R. Sean Sanders, Sirish Shah, John Shaw, Zhenghe Xu, and Anthony Yeung.

Today the department focuses on four priority research areas:

- Energy and Natural Resources: After nine decades of research the department continues to dominate oil sands research. Jacob Masliyah, Murray Gray, John Shaw, R. Sean Sanders, and Anthony Yeung all hold NSERC IRCs in the oil sands area.
- Nanotechnology and Nano-engineering: Robert Burrell, Canada Research Chair in Nanostructured Biomaterials, is best known for his invention of medical dressings that use the anti-microbial properties of silver to speed healing of burn victims. Dr. Ken Cadien, whose research will affect silicon technology, micro-electromechanical systems (MEMS), fuel cell technology, nanotechnology and much more, holds the Canada Research Chair in Nanofabrication.
- ICT (Information Communications Technology): Sirish Shah, an internationally respected expert in computer process control, is currently researching the application of advanced algorithms in monitoring performance and problem diagnosis in industrial plant automation.
- Biomedical Engineering: Hasan Uludag is at the forefront of this vital research area with his work in bone regeneration and remodelling. His focus is on the stimulation of bone repair within specified sites in the body.



Dr. Robert Burrell holds the Canada Research Chair in Nanostructured Biomaterials.

The past 100 years have seen a continuous succession of new engineering technologies. As soon as engineers solve one problem, another challenges their ingenuity. New industrial processes to reduce environmental damage are an increasingly urgent priority, as are the applications of biomedical engineering for an aging domestic population.

As future challenges continue to arise, our chemical, metallurgical, and materials graduates will continue to lead the world.

s Engineering

received a Rutherford Award for Excellence in Undergraduate Teaching from the University of Alberta in 1997. He holds the NSERC Chair in Oil Sands Engineering.

Dave Mitlin — Is an associate professor of materials engineering. His research interests include nanostructured materials, microstructure and mechanical properties of thin films, epitaxy, microelectronic processing, physical metallurgy, solid-state phase transformations, diffraction and crystallography, and transmission electron microscopy.

Fred Otto — As a researcher, Otto focused on thermodynamics, mass transfer, and computation of separation processes. He was an effective teacher of mass transfer, air pollution, material and energy balances, and reactor design.

Donald B. Robinson — Joined the department in 1948 as an associate professor specializing in thermodynamics, became chair of Chemical Engineering in 1959, and was founding president of the Canadian Society for Chemical Engineering.

R. Sean Sanders — Holds the NSERC Industry Research Chair in Pipeline Transport Processes. His research interests include multiphase flows, interparticle and fluid-particle interactions in concentrated slurries, core-annular flow, pipeline conditioning of oil sands, water-assisted heavy oil pipelines, tailings transport and placement, rheology of industrial, non-Newtonian mixtures, centrifugal pump performance, and pipeline wear.

Sirish Shah — Is the recipient of the NSERC-Matrikon-ASRA Industrial Research Chair in Computer Process Control and winner of the NSERC University-Industry Synergy Award (2003).

John Shaw — Holds the NSERC Industrial Research Chair in Petroleum Thermodynamics and has held visiting professorships at the Technical University of Delft (Netherlands), the Institut Francais du Petrole, and the Syncrude Research Centre.

Hasan Uludag — Is a recognized world leader in developing engineered materials for regenerative medicine. The Uludag lab is exploring bone regeneration and remodeling. His research interests include biomaterials, tissue engineering, and drug delivery.

Zhenghe Xu — Holds the Canada Research Chair in Mineral Processing and the NSERC-EPCOR-AERI Industrial Research Chair in Advanced Coal Cleaning and Combustion Technology.

Anthony Yeung — Project leader with the Imperial Oil-Alberta Ingenuity Centre for Oil Sands Innovation, Yeung is the most recent recipient of an NSERC Industrial Research Chair in Non-aqueous Bitumen Extraction.

Karl A. Clark

E.O. Lilge

Jacob Masliyah, OC

George W. Govier

Mechanical Engineering

The mechanics of change

by Bruce White

Fifty years ago most males by the age of 16 could name virtually every part of a car engine—air filter, carburetor, radiator, distributor and the spark plugs.

But pop the hood of a 2008 model and few of us can identify more than the reservoir for windshield-cleaning fluid. Changes in the design of the automobile are a good indicator of how the mechanical world has evolved in the 50 years since the creation of the University of Alberta's Department of Mechanical Engineering in 1958.

Today's cars are smaller, lighter, more efficient, less polluting, safer and more reliable. The 16-year-olds looking under the hood also changed, points out Dr. Larry Kostiuk, chair of Mechanical Engineering. Fifty years ago, Alberta teenagers, especially those raised on farms, seemed to be born with an oily rag in their hands. They could remove a carburetor, take it apart, find the problem, and then fix and reinstall it. Turning these young men (and a few women) into mechanical engineers was a matter of formalizing in their minds what their hands and eyes already knew—by adding large doses of applied math and physics.

Alberta in the '50s was still very much an agricultural province. The department's first graduate student in 1959, a Vancouver city boy named Don Bellow, remembers being surprised that the fall term in Alberta didn't begin until September 15, to allow students to help with the harvest.

Mechanical engineering professor David Checkel has seen as many changes to the university as he has seen changes to cars. Checkel and Robert Koch are researching digitally controlled engine valves that adapt to demands placed on them.

Fast-forward to 2008, the 50th anniversary of the department and the 100th anniversary of the University of Alberta. Mechanical Engineering is now the largest single program within the Faculty of Engineering (although not the largest department). The young men and women going into mechanical engineering are analytical and academically brilliant—on average they left high school with grades of 87 per cent—and much more likely to be urban.

But more often than not, their hands-on experience has been limited to keyboard and mouse. They are finding their place in a world heavily invested in analysis and design, and often too small to touch. Teaching mechanical engineering has evolved in this age. Less time is spent on math and physics and a lot more on the practical side, through hands-on instruction, co-op placements and extra-curricular competitions.

David Checkel, a mechanical engineering

In a variation on the traditional ribbon cutting ceremony, the Mechanical Engineering Building was opened with a ceremonial cable-cutting.

professor and a car enthusiast, has witnessed many of these changes. As a student from Coronation, Alberta in the 1970s, he studied the combustion reaction that powers piston engines. As a mechanical engineering professor, he has analyzed exhaust gases, examined battery technology for use in electric and hybrid cars, and researched many other aspects of automotive technology.

Checkel, along with colleague Dr. Robert Koch, is currently working on digitally controlled engine valves that open and close without a cam. This technology will allow an engine to power up without a starter motor, and to operate on six, four or three cylinders as conditions demand, tune itself for efficient highway cruising and instantly kick into high-performance mode when you pull out to pass a truck.

Of course, there is much more to mechanical engineering than cars. Some machines are bigger than ever (as in Fort McMurray), but the focus these days is on making machines smaller and more elegant, as in micro- and nanotechnology. Yet even these small miracles have come to seem routine. People sometimes take them—and their inventors—for granted.

"As engineers, we refer to ourselves as 'the silent profession' because people don't really know what we do," says Dr. Douglas Dale, who served twice as the department chairman. "You get in your car or into an airplane and nobody knows how this wonderful machine works. Of course, thousands of people were involved in it, and everyone has their own little contribution."

U of A mechanical engineering students and professors are making discoveries about everything from gas plumes to artificial limbs to better golf club shafts. The common thread is that mechanical engineers design, manufacture and operate machines. They also study the engineering economics of machines, their impact on the environment and ways to make them safer to operate.

For its first 50 years the University of Alberta operated without a mechanical engineering department, due a cost-saving agreement with the University of Saskatchewan in the 1920s; chemical engineering was taught in Edmonton and mechanical engineering in Saskatoon.

Dr. George Ford (Civil '42), founding chairman of the department, taught every engineer who passed through the U of A for 40 years. As department chair and later dean of engineering in the 1970s, he was a builder.

Ford also wrote eloquently about the history of U of A Engineering. In his 1988 book *Sons of Martha*, he describes how the department of Mechanical Engineering got going in the fall of 1958 using borrowed labs and scrounged equipment for its 21 students. Their decision to enroll was a bit of a gamble, because Dr. Ford had his new department up and running before the provincial bureaucracy had gotten around to sanctioning it.

Among Ford's expert scroungers was Bellow, the department's first graduate student, first doctoral student and a part-time lecturer in applied mechanics. He remembers Ford frequently handing him government surplus lists, which he would comb through looking for useful equipment that might be had on the cheap.

"As we grew in size," Ford wrote in his book, "we took on an aura of affluence. We could now boil water in many diverse and fancy ways, we acquired wind and water tunnels with hot and cold running fluids, we

Research into the biomechanics of the human body—in this case measuring the effect of pressure on the jaw—is a hallmark of innovation at the Department of Mechanical Engineering.

timeline

History of Mechanical Engineering

1958 Dr. George Ford heads new Mechanical Engineering Department.

1959 Department receives approval from the provincial government.

1960 First graduating class of 19 B.Sc. degrees and one M.Sc. in Mechanical Engineering.

1963 First PhD in Mechanical Engineering.

1971 Ford becomes dean of Engineering.

1972 Dr. James S. Kennedy takes over as chair of the Mechanical Engineering Department.

1972 Mechanical Engineering Building opens.

1975 Dr. D.G. Bellow becomes chair.

1981 Mechanical Engineering is first department to launch a co-op program.

1984 Dr. M. Gary Faulkner becomes chair.

1988 Ford publishes *The Sons of Martha*, a history of the U of A Faculty of Engineering from 1909 to 1988.

1990 Dr. J. Douglas Dale becomes chair of the department.

1994 Dr. Thomas W. Forest becomes chair of the department.

1999 Dr. Gary Faulkner becomes temporary chair.

2000 Dr. J. Douglas Dale becomes acting chair of the department.

2002 Dr. Larry Kostiuk becomes the chair of the department.

2005 George Ford dies.

2005 Indira Samarasekera, a mechanical engineer, becomes president of the U of A.

2008 The Department of Mechanical Engineering celebrates its 50th anniversary, coinciding with the U of A's centennial.

obtained instruments and gadgets that screeched all levels of noise which we then measured."

Ford and his colleagues built a curriculum focused on the fundamentals of strength of materials, dynamics, fluid mechanics, thermodynamics and heat transfer, setting a new trend for Canadian universities. Research probed areas of interest to Alberta's economy: resource development, energy conversion and utilization, cold-weather engineering, design, and engineering management. The department was also open to collaborations with other disciplines.

By the '60s, with a growing number of students and faculty—now including Bellow, the department's first PhD—and a growing inventory of equipment, the department lacked only a home on campus. For years, it made do with temporary quarters in the old power plant, in temporary huts next to the Physics Building and later in the new power plant south of the Jubilee Auditorium.

[Don Bellow] and Peter Adams, dean of Engineering, would spark a major transformation of the faculty by creating western Canada's first engineering co-op program.

The second power plant had some issues during its commissioning, including flooding. Bellow remembers one trying term, warning students not to switch on the electricity for their experiments while standing in a puddle. The department next moved to temporary space in the new Chemical Engineering Building, opened in 1967, while it worked on the design and construction of a home of its own—a task that Ford again handed to Bellow.

With much of its pipe and ducting exposed, to suggest industry, the new black building featured large windows to "open the building to the world," recalls Bellows. Opened in 1972 at a cost of $3.2 million, it remains one of the notable modern buildings on campus. It housed an array of specialized labs: wind tunnels, water channels, cold rooms, vibration lab and computer lab.

Some ideas just set the world on fire. When a textile scientist contacted Dr. Douglas Dale about fireproof fabrics, a creative collaboration was born, ultimately leading to standard-setting research into heat-resistant clothing. Here, a mannequin named 'Harry Burns' puts garments to the test.

In 1975, Bellow became the head of the department he'd joined as a graduate student 17 years earlier. He and Peter Adams, dean of Engineering, would spark a major transformation of the faculty by creating western Canada's first engineering co-op program. Launched in Mechanical Engineering in 1981, the optional co-op program combines academic study with well-paid, hands-on engineering work with employers. Surprisingly, it proved at first to be a hard sell to both faculty and students.

Eras of great growth are often followed by periods of retrenchment. The government of Premier Ralph Klein imposed a 21-per-cent budget cut in the early '90s.

Dr. Tom Forest became department head at the height of the budget cuts. At the same time, quotas required the department to continue to accept the same number of second-year students. The budgeting process began to border on the bizarre. There was no money for telephones, for example, so to stay connected to the outside world the department relied on "soft money," such as rental fees charged to other departments for the use of the machine shop.

When reinvestment came in the late '90s, reality often lagged behind the lavish official announcements. Typically, Forest notes, the funding for five new positions would end up supporting only three, because the plan took no account of inflation, salary increases and other costs. It became necessary to cannibalize new positions to keep old ones operating.

Researchers, then as now, worked independently, forming into spontaneous groups when they discovered they had interests in common. Forest's specialty was phase transition—the mechanics of a material's change from solid to liquid to vapour. He was involved with cold weather engineering research and with the Alberta Home Heating Research Facility in Ellerslie, where he studied moisture problems in wood frame houses.

Often, says Dale, the collaborative process begins with a phone call from a colleague in another department, such as a medical doctor who has a question related to fluid mechanics such as why an asthma drug inhaler doesn't work properly. In Dale's case, a textile scientist's call about fireproof fabrics led to standard-setting research into heat-resistant clothing.

Another collaboration resulted in the world's first orthodontics simulator—mechanical engineering of the mouth. Project leaders Drs. Jason Carey and Roger Toogood expect to develop a system that will take data from MRI scans of the jaw and develop a model for each patient. This would reduce treatment time and the number of follow-up visits, while reducing the risk of damage.

A glider in flight near Chipman, Alberta. Mechanical Engineering professor Dave Marsden, whose research included the development of 'winglets' seen on aircraft today, set a world record in 1984 for gliding 1,121 kilometres surfing the currents of a massive Prairie storm from Edmonton to Winnipeg.

The department now offers a biomedical option in mechanical engineering, which will graduate its first class in 2010. "The discovery of engineering by medicine will have a profound effect; we can contribute a lot," says Kostiuk.

In the next 50 years, Kostiuk also expects to see growth in mechatronics, the convergence of electrical and mechanical engineering. The field employs electrical motors, controllers and sensors in the design of robots and to control joints and movement—an area with a huge range of industrial and biomedical applications. Kostiuk hopes to soon offer a BSc in mechatronics. Nanotechnology and surface sciences will also be important emerging themes.

Some feats of mechanical engineering are thrilling on a more personal level. Take for instance Dave Marsden, whose professional work included ultralight aircraft design using the department's wind tunnel. In 1984, Marsden set an enduring world distance record of 1,121 kilometres by gliding on the air currents ahead of a prairie storm all the way from Edmonton to Winnipeg in a single June day. Who says thermodynamics has to be dull?

As for the first graduate student, Bellow left the department in 1989 to take a senior position in facility management for the university. He retired in 1996. Since 1958 he had seen it come from a startup enterprise with 21 students taught by eight staff; today it has 40 faculty members teaching 650 undergraduate, and 200 graduate and doctoral students. He witnessed the replacement of slide rules by handheld calculators, and later by laptop computers.

But some things haven't changed in 50 years—such as the laws of thermodynamics and the human desire to design and build new and better machines.

Hannah Nash provided additional research for this article and the accompanying chronology.

Notable people in Mechanical Engineering

Don Bellow — The first graduate student in the department of mechanical engineering in 1958–59, Bellow later would become the department's first PhD and first homegrown professor. His imprint also endures on the Mechanical Engineering Building, which he helped to design, and in the co-op education program, which as department chair he helped to set up in the 1980s. His research interests included cold-climate engineering. He left the department in 1989 and retired from the university in 1996.

David Checkel — A motorsport enthusiast, Checkel has studied many aspects of the automobile, including the reaction of fuels, exhaust gases, sparkless ignition, and battery technology for electric and hybrid cars. He also advises students entering automotive design competitions.

Douglas Dale — Twice head of the department, Dale has high-profile research projects ranging from Alberta Home Heating Research Facility in Ellerslie (begun by R. Gilpin), to testing the fire-resistant properties of fabrics for industrial and military uses.

Gary Faulkner — A highly respected teacher, Faulkner conducted pioneering research into the mechanics surrounding dental implants. This was an early example of the emerging field of biomechanical engineering, which continues to be a fertile area of research for many in the department, including David Budney, Jason Carey, Donald Raboud, Roger Toogood and Walied Moussa.

George Ford — Fifty years ago Ford had a Mechanical Engineering Department up and running at the U of A before he was given permission to do so. As chair of that department, and later Dean of Engineering, he helped develop the department's strengths in thermodynamics, cold-climate engineering, project management and engineering economics. He also was the engineering faculty's in-house historian.

Larry Kostiuk — An expert in thermodynamics and combustion, and author of Alberta's standards on gas flaring, Kostiuk is the department's current chair. He is steering it toward a future in fields that would have seemed incredibly exotic in 1958—biomechanical engineering, nanomaterials and mechatronics.

G.S.H. Lock — Working in the late 1960s with graduate student David Morris, Lock developed artificial hearts that were implanted with some success in lab animals.

David Wilson — Wrote the book on the dispersion of stack gases from refineries and petrochemical plants. His work continues to underpin Alberta's air quality standards.

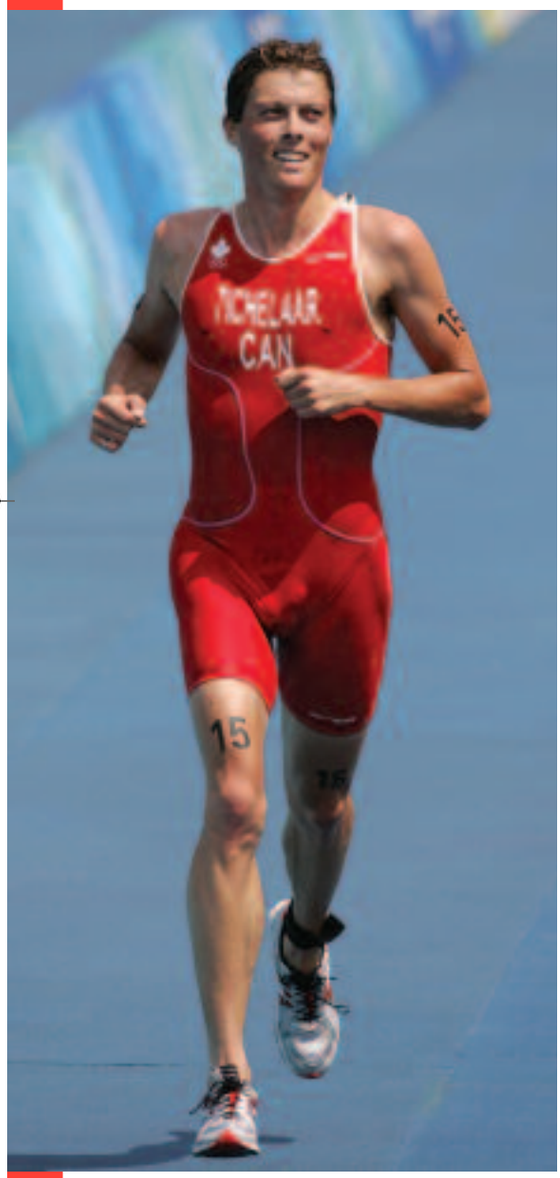

George Ford


Don Bellow


David Checkel


Larry Kostiuk

Going the Distan



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Paul Tichelaar represented Canada in the men's triathlon at the Olympics in Beijing.

On August 19, Paul Tichelaar (Electrical '05) sweated it out in the suffocating heat, taking 28th place in the men's triathlon at the Beijing Olympics.

It was the culmination of a dream that began to take shape when Tichelaar was a young competitive swimmer, just ten years old. As he grew older, his interests turned to competitive cycling and then to triathlons.

With respectable showings in international and world cup competitions, Tichelaar set his sights on the Beijing Olympics—but knew he needed to redouble his efforts in order to compete at that level. Until recently, he had been working full time in Edmonton for Magna IV Engineering, while also training and competing. Many of his strongest competitors, in contrast, make a full-time commitment to the sport. Tichelaar needed to match them in training if he were to match them on the Beijing course.

When Tichelaar approached his employers, Magna IV gave him a 10-month leave of absence to pursue his dream. "They were very supportive, and for that, I have such loyalty to them," he says.

Tichelaar put the time to good use. By June, he needed to place higher than eighth at a Vancouver triathlon to automatically win one of three Canadian triathlon spots—one was already secured by 2000 gold medalist Simon Whitfield, and the other two were vacant.

Failing to place above eighth would leave Tichelaar's fate in the hands of a Triathlon Canada committee, which would appoint the two other national competitors. The committee had been planning to select two athletes who would commit themselves to helping Whitfield to the podium rather than medal for themselves. Tichelaar sparked a controversy prior to the race when he publicly objected to participating in the committee's team-based approach. He argued that he should be given the opportunity to perform at his peak individual level, rather than sacrificing his own performance to aid Whitfield.

Ultimately, the committee asked Tichelaar to support Whitfield. Tichhelaar reluctantly agreed, but eventually the committee and team decided that Tichelaar would be allowed to run his own race. The third Canadian on the team, Colin Jenkins, would support Whitfield.

Training for the sweltering heat and humidity of Beijing included sessions in a heat chamber, in order to condition Tichelaar's body for an all-out effort in a hostile environment.

"The temperature in Beijing can be up in the 30s for sure, and with the humidity, that really does change the way an endurance race is run," said Tichelaar during a July interview. "In normal weather, the limiting factor is how much oxygen you can get into your muscles. And in the heat, the limiting factor is how much heat you can dissipate. The idea is to get your body used to having a core temperature that is elevated so that when it comes time to race, the automatic reaction is not to panic.

"A lot of training is about teaching your body not to panic, that it isn't in critical danger."

Despite the training, the heat may ultimately have been his undoing.

"I suffered in the heat," he says. "I was in great shape for the race. I swam well, I was strong on the bike and I pushed hard on the run. I would have liked to have had the race of my life at the biggest race of my life, but that didn't happen. Even so, I am not at all disappointed."

"A lot of training is about teaching your body not to panic, that it isn't in critical danger."

ce

A strong cyclist, Tichelaar's best strategic move might have been to get in with a breakaway group so he could begin the 10-km run portion of the event earlier. Unfortunately, he couldn't pull it off.

"I felt strong on the bike and climbed very well, but I was too far back in the peloton when the small breakaway did get off the front to go with it—I would have liked to have been in there. The heat made me more conservative than I would normally have been. Pacing is important on a hot day."

In the end Whitfield, who had been dropped by a lead group of runners, poured on the speed and worked his way back into the pack and onto the podium for a silver medal—providing incredible drama to the finish. Tichelaar, who calls Whitfield "an inspiration," missed the action.

"My only regret from the race was that I wasn't a little faster. I would have loved to see the sprint finish live," he says. "What an exciting finale for the top four. Simon has been supremely dedicated to the sport for so long. He's a deserving two-time medalist and an inspiration. He pushed himself so hard to get that medal and is incredibly deserving. I am very happy to see him succeed."

And, while Tichelaar didn't succeed in his goal of a podium finish, he did succeed in getting to the Olympics and giving it his all. That, he says, is reward in itself.

"I'm deeply satisfied with my performance. I dedicated as much of my life into the training as I was willing to and I had a result that was in line with my level of dedication. … As cliche as "doing my best" is, that is what the Olympics are about to me, and I'm proud of my approach.

"What an honour it has been to represent my country, province, city, family and friends. I would have achieved nothing without the support I have enjoyed. I hope I have done them proud."

GOODsports

by Ryan Smith and Richard Cairney

Engineering alumni have left their mark not only in their profession, but also in extracurricular pursuits. Here is a brief – and we mean brief – list of some alumi who have made notable achievements in athletic pursuits.

Matt Baldwin
(Petroleum '51)

Baldwin didn't play for a varsity team at the U of A, but he is known, quite simply, as one the greatest curlers to ever play the game. Baldwin won the Alberta Curling Championships five times and the Brier Tankard as Canada's champion curler three times (1954, '57 and '58). He is an inductee of the Edmonton and Canadian Sports Halls of Fame, as well as the Canadian Curling Hall of Fame.

Murray Cunningham
(Civil '97)

Known for his ferocious defending and rebounding, Cunningham anchored the Golden Bears basketball national championship teams in 1994 and '95. The six-foot-five power forward and former league all-star and team MVP is the only U of A athlete in the past 25 years to play both basketball and football during the same season, a feat he accomplished in the 1995-96 season.

Cara Denkhaus
(Civil '02, M.Sc. Structural '04)

Denkhaus only played one year for the Pandas rugby team—but what a year. In the 1999-00 season, the Pandas won the first of five consecutive national titles, with Denkhaus scoring two tries in a 20-3 upset in the final game over the defending champion Guelph Gryphons. Denkhaus also earned CIAU Rookie of the Year honours and the Kathlene Yetman Award, presented annually to the U of A's female Academic All-Canadian of the Year.

Grayson Michael "Mickey" Hajash
(Mining '47)

Hajash excelled in hockey, softball, basketball and track and field, but it was on the gridiron that he distinguished himself at the U of A. A feared competitor for the football Golden Bears, Hajash played fullback on offense and linebacker on defense, rarely substituting out of the game. He was the U of A's outstanding athlete of the year in 1947 and went on to play for the CFL's Calgary Stampeders, including in the 1949 Grey Cup. The Stamps lost 28 – 15 to the Montreal Alouettes.

Edward Lucht
(Chemical '54)

Lucht dominated as a post player for the Golden Bears basketball team, leading them to conference titles in each of the four years he played, including 1952, the U of A's first appearance in a basketball national final. At six-foot-eight, Lucht once scored 88 points during a game, a record that still stands, more than 50 years after he accomplished the feat. After Lucht graduated, he starred for a number of club teams and also represented Canada at the 1956 Melbourne Olympics.

Dr. Don Stanley
(Civil '40)

Aside from competing in intramural basketball and swimming, Stanley played varsity hockey, football and soccer during his U of A days. In particular, he starred on the ice, leading the Western Intercollegiate Championship Golden Bears in scoring for three consecutive years. He also played for Canada at the 1949 World Hockey Championships in Sweden, where he was considered the most outstanding player in the tournament. Stanley went on to found the company that later became Stantec, and passed away in 2001.

Frank King
(Chemical '40)

King served as chair of the Calgary Winter Games Organizing Committee, leading a group that organized the 1988 Winter Olympics. Insiders say the '88 Olympics were the best winter games ever. To this day, Calgary and the province benefit from the legacy of the games in facilities and world-class athletic training opportunities.

Bob Brawn
(Chemical '58)

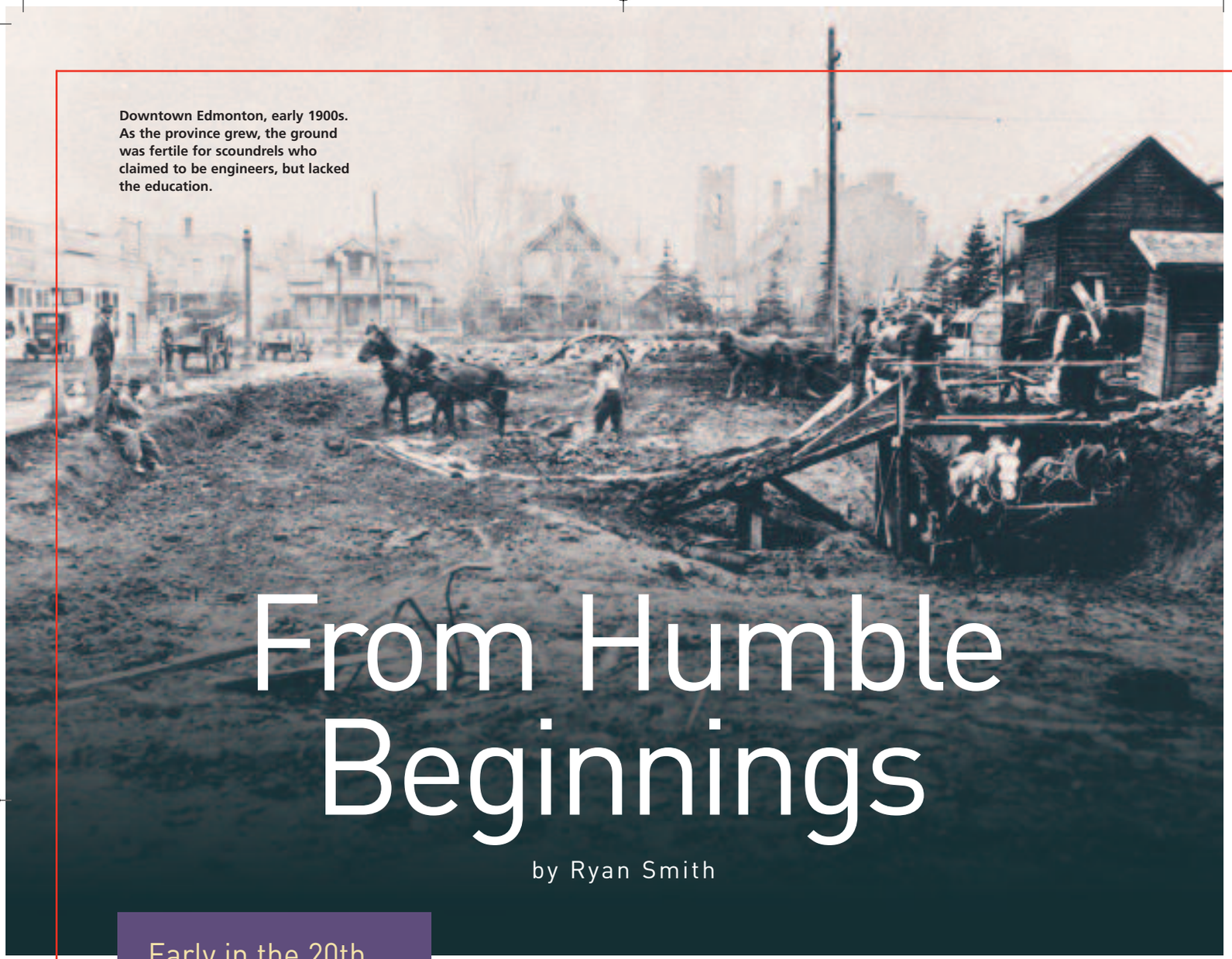
Brawn has founded a number of vibrant resource companies and worked alongside his old high school-and university pal Frank King on the Calgary Winter Games Organizing Committee. Brawn's business savvy had impact: the Games generated an unprecedented total cash endowment of $150 million.

Bill McCaffrey
(Civil '82)

McCaffery was part of the infamous Dirtshooters, a group of athletically talented students from Calgary who dominated the U of A's intramural sports scene during the mid-1970s. McCaffrey is president and CEO of MEG Energy Corp., an oil sands company with a major stake in developing the Athabasca oil sands.

Tracy Layton
(Mechanical '72)

Fresh out of high school, where he had played on every school sports team, Layton planned to become a high school physical education teacher. In a requisite first-year volleyball class he showed enough potential to become a member of the Bears intercollegiate volleyball team in 1965. He played for two years while studying in the Faculty of Physical Education and Recreation, enrolled in a commercial flight training course in 1967 and a year later entered the Faculty of Engineering. He played on the Bears intercollegiate volleyball team for three more years. In 1975, he and his brother incorporated Layton Bros. Construction Co. Ltd.



Downtown Edmonton, early 1900s. As the province grew, the ground was fertile for scoundrels who claimed to be engineers, but lacked the education.

From Humble Beginnings

by Ryan Smith

Early in the 20th century, Alberta was the Wild West for people who called themselves engineers.

"At that time there were a lot of debates about who was and who wasn't an engineer. Sometimes people would show up and say 'I'm an engineer,' and the city of Calgary would hire them even though they often had no qualifications whatsoever for what they were doing," says Dr. John Gilprin, an Alberta-based historian.

"A lot of projects went really wrong," he adds. "Project management was terrible, and a lot of money was wasted."

Alberta's medical professional association formed in 1905, and the legal profession created the Law Society of Alberta in 1907. But the engineering profession lagged behind, not forming its own association until 1920.

"I think it was easier to form associations in medicine and law because a lawyer is a lawyer, and a doctor is a doctor whatever field of health you study," says Gilprin.

"It was different for engineers. There wasn't the same sort of debate going on in the other professions to try to clarify roles—at least not to the same degree—as there was in the engineering profession. There was a time at the turn of the 19th century when anyone who operated a machine was considered to be an engineer."

Gilprin, who is researching a book about the history of engineering in Alberta, says the construction of the Canadian Pacific Railway (CPR) through Alberta in the late nineteenth century brought the first significant influx of engineers to the province.

"The CPR marked an incredible transition to locomotion transportation from horse drawn carts. A lot of engineers were needed to make this happen, and most of them came from Europe—mainly Britain—and the U.S."

As the 20th century dawned, the engineers kept coming. "With the development of Calgary and Edmonton there were a number of major engineering projects underway, including the creation of street systems, railway systems, and telephone and electrical systems, among others," Gilprin says.

"In the period up to 1914 you had rapid development in the urban regions, so you had

a real diversity of specialists coming to the province within the engineering profession—hydro, mining, civil and mechanical."

The First World War stifled development in Alberta from 1914 to 1918, but rapid growth and technical advances began to happen again almost as soon as the war ended.

A leading Alberta engineer at the time was Frederick Peters, who served as the commissioner of irrigation in the federal Department of the Interior. Peters had the daunting task of planning all the irrigation projects in Alberta and then ensuring they were done properly.

"Peters was one of first examples where a senior bureaucrat held a position not based in Ottawa. I have the correspondence between Peters and the superintendent of irrigation in Ottawa, and you can safely conclude from the letters that these two guys did not like one another," smiles Gilprin.

Spurred by a desire for independence and to regulate the engineering profession in Alberta, Peters spearheaded the foundation of the Association of Professional Engineers. The association—which formed as a result of the passage of the Engineering Professional Act in the provincial legislature on April 19, 1920s—had an initial membership of 69 civil, 20 mining, 10 electrical and 7 mechanical engineers.

The University of Alberta played a central role in the association from the beginning. Intially—and for many years after—the U of A Senate decided who could join the association. Also, the association provided bursaries and awards for U of A engineering students, a practice it continues today.

"Had the U of A not been around to provide the provincial government with an agency to regulate the profession in beginning, it would have delayed the maturity of the association," Gilprin says. "The U of A was an institution the government trusted to regulate the profession and act as sort of a surrogate parent to the association.

"The U of A trains the engineers and then the association takes responsibility that the engineers maintain certain standards of practice, so the two need one another, and it has been an ongoing mutually beneficial relationship."

In 1930, a new Engineering Act made it mandatory for all professional engineers to become members of the association—and to pay annual dues, which at the time were $2.

Growth in the engineering profession in Alberta ebbed through the 1930s until the end of the Second World War. During this period, the association continued it struggle to define who was and who wasn't an engineer. With the discovery of oil in Alberta, a debate raged over whether or not to consider geologists as engineers.

After the discovery of the Leduc oil field in 1947 sparked a jump in engineering activity in the province, the association helped establish the petroleum engineering program at the U of A. The association also began to lobby the provincial government on the U of A's behalf in order to increase the number of positions available for students in the U of A Faculty of Engineering. It also pushed for a new building on campus exclusively for the Engineering Faculty.

The association—which formed as the result of the passage of the Engineering Professional Act in the provincial legislature on April 19, 1920—had an initial membership of 69 civil, 20 mining, 10 electrical and 7 mechanical engineers.

In 1955, the association expanded to include geologists and geophysicists as professional engineers. This raised complaints by both geologists and geophysicists, as they wanted to be designated separately. A committee was formed in 1956 to address the issue, and the association eventually settled on its modern name: the Association of Professional Engineers, Geologists and Geophysicists of Alberta (APEGGA).

Over the decades, as development in the oil sands expanded and immigration to Alberta increased, the association also grew—to 17,000 by 1980, up from 630 in 1950.

In 1982, the association decided to impose a written test for all applicants. In the mid-'90s, the association established mandatory reporting of the professional development efforts of its members, and raised the professional service requirement to four years—up from two—before an engineer could claim full membership.

"Our mandate at APEGGA is to effectively regulate the practice of engineering in Alberta, and we've considerably reduced those instances of illegal practice or risk to the general public by insisting that there are competent and qualified professionals who take responsibility for their work," says Albert Schuld, APEGGA's deputy registrar.

"We were one of the earlier self-governing professional associations in Canada, and we've been successful in ensuring that there has been a high quality of engineering work done in Alberta—everything from the building of bridges to our telephone and Internet systems, for example."

Despite its Wild West beginnings, the engineering profession in Alberta (with more than 50,000 members) is now regulated like a well-oiled machine, says Neil Windsor, APEGGA's executive director and registrar.

"The engineering profession in Alberta is currently enjoying a most unusual rate of growth due to the high rate of resource development in the region, and we do not expect that this will decrease in any dramatic fashion in the near future.

"As the largest profession in the province by far, the APEGGA council feels that we have an obligation not only to be an active, state-of-the-art regulator, but also to represent the views of our profession and support the activities of the province and the community at large."

"We are proud of our history and our record, and we see ourselves as leaders not only in the profession but also in the overall community," adds Windsor. "We expect that to continue as we mature and grow in our role."

City of Edmonton Archives

Awarding PRIDE

by April Serink

Second-year engineering student Morgan Gwin is the most recent of a growing number of female Faculty of Engineering students to earn the prestigious C.D. Howe Memorial Award.

There was a time, not so long ago, when virtually nobody saw a place for female engineers. In fact, when the Civil Engineering building opened at the U of A in 1960, it lacked women's washrooms. Even though a quarter century had passed since the graduation of Esther Rabkin (Electrical '35), planners did not envision a future that included female engineers.

Agnes Yuen (Chemical '01) experienced University of Alberta before the completion of the new NREF and ETLC buildings. "It was kind of funny," she recalls, "the big boxes in the ladies' washrooms obviously covering urinals."

Fortunately, times have changed. Women still represent a minority in engineering, but they have certainly left their mark at the U of A—racking up prestigious awards and scholarships year after year. "When I applied to different universities across the country, the potential to apply for so many scholarships really played a huge factor in deciding to attend U of A instead of Waterloo," recalls Yuen.

When Yuen won the C.D. Howe Memorial Award in 1997, for superior academics leadership in her first year, she started a trend. U of A engineering students have proudly won nine C.D. Howe Awards since then, including every female award since 2005. In addition to Yuen, U of A female winners include Katherine Svrcek (Civil '03), Rebecca Pinto, Alma Ornés Gutiérrez, and Morgan Gwin.

Each year, the C.D. Howe Memorial Foundation Engineering Awards Program presents two awards to engineering students, one female and one male. The award recognizes top marks and community participation among students completing their first year, and candidates are nominated exclusively by deans of engineering. The foundation was established in 1961 to memorialize the Right Honourable Clarence Decatur Howe, an engineer who served in the governments of Mackenzie King and Louis St. Laurent.

"The award sets a standard of excellence for the institution," says Rebecca Pinto. "It provides a sense of confidence for students that U of A is competitive on a national and international level." Morgan Gwin points to the award's role in encouraging more women to enter the profession.

Of course, the award also inspires personal pride, says Alma Ornés Gutiérrez.

"Personally, the award is such a huge honour, especially after arriving to Canada from Venezuela a year earlier and learning to play by new rules in a new country."

The U of A's success with the C.D. Howe Award reflects the cornerstone values stressed by President Indira Samarasekera: people and their talents, structure and organization, integrated learning, discovery, and citizenship, and engagement with communities. A distinguished engineer and the university's first female president, Dr. Samarasekera provides an excellent role model for females in this predominantly male discipline.

Dr. Samarasekera knows first-hand the special challenges of being a female engineer. "There weren't very many women in engineering, certainly in Sri Lanka or California or at UBC. But you get used to it. It was difficult at first to make the adjustment."

The scholarship provides $7,500 CAD per year for the students' remaining three years of study. By easing financial stress, the award helps recipients to maintain their superior marks without sacrificing their extracurricular activities and volunteer efforts. "Being recognized with winning the [C.D. Howe Award] encourages students, as it did me, to have something to aim for in keeping marks high and not to quit volunteering," says Yuen. Gwin agrees, noting that her own motivation and momentum increased after winning the award.

As classes become more challenging over the course of the program, maintaining a high grade-point average becomes an increasingly tall order. "Third year was really tough," says Yuen, "Although the award made the biggest impact coming out of school I had no loans, so I was able to travel after graduation and then discuss the award's significance with employers.

"The significance of the award being a big deal occurred to me afterward. No one really cares about marks after school, because it's the skills you learned that follow you. The Faculty provides and encourages the skills beyond methods to solve problems. The award confirmed people see me as a well-rounded person, not just a slate of extracurricular activities and high marks."

"The award recognizes people who rise up to be leaders, and teaches you to get involved," agrees Pinto. Her volunteer activities include canvassing for the Alberta Kidney and the Alberta Heart and Stroke Foundations, organizing and participating in a co-recreational volleyball team for campus intramurals, and volunteering for WISEST (Women in Scholarship, Engineering, Science and Technology).

The U of A's success with the C.D. Howe Award reflects the cornerstone values stressed by President Indira Samarasekera: people and their talents, structure and organization, integrated learning, discovery, and citizenship, and engagement with communities.

Gwin, who also volunteers for WISEST and participates enthusiastically in sports and campus intramurals, says that winning the C.D. Howe felt different than winning at sports. "You feel proud but totally embarrassed, because it's entirely an individual achievement, whereas I am used to succeeding as a member of a team."

Ornés Gutiérrez points out that her volunteering efforts also contributed to her own personal and professional growth. "The volunteer experience from International House helped shape me best by getting people from different cultures to communicate and to live harmoniously with each other," she says. "In Alberta, I will work with people from all over the world and need to communicate my methods."

The award has inspired Pinto to give back even more. "It allows me to get the most out of my university experience and to get involved." Pinto dedicates several hours a week to Engineers Without Borders as well as BADSA (Blood Awareness and Donation Students' Association), and hopes to pursue medicine.

Gwin, whose focus is on biomedical engineering, sees medicine in her future as well, although from a dentistry angle. "I want to work to develop the technologies and machines required to speed up orthodontic treatment times." She adds brightly that her experience with braces "going awry" compelled her to improve the experience for others.

At Syncrude, Yuen works toward ensuring sustainability of resources in future development. The C.D. Howe Award helped convince her that she and other women have essential contributions to make as engineers. "In a predominantly male dominated field, there are many days I am the only female in a room, but I enjoy the challenge. Women's emotions tend to get involved, which makes us unique and creates a different thought process toward solving the problems beyond formulas."

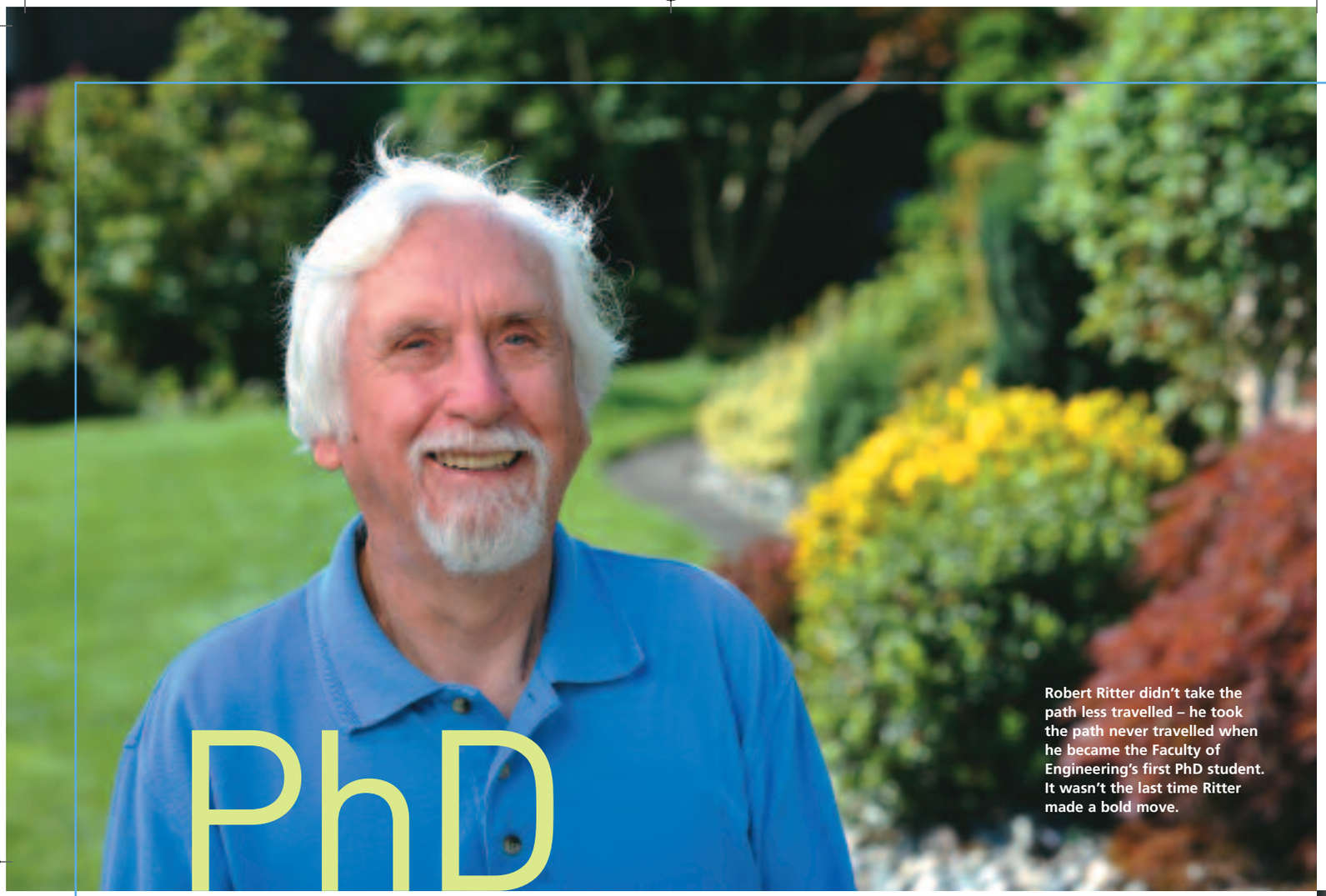
Yuen trusts her experience and achievements will provide a model for her younger sister—who is now pursuing her own engineering degree at the U of A.

Ornés Gutiérrez looked to her parents—both chemical engineers—as examples for her engineering aspirations. "I've always admired my mom who is very hands on as an engineer, and then my dad is more of a lab person as an engineer." With both extremes in her background, she has chosen a path in the middle, in the civil-environmental field.

As a personal ambition, Pinto strives to be a positive role model to children, especially young girls. She particularly enjoys tutoring students in math and science. "Giving someone the confidence to accomplish their goals gives me an amazing feeling," she says.

The C.D. Howe Award recognizes people at a crucial time of their academic careers—at the completion of their exciting first years, with three more years to take their visions even farther. The U of A's impressive roster of female recipients proves that the place of women in the profession now extends far beyond the right to have their own washrooms.

Bluefish Studios



Robert Ritter didn't take the path less travelled – he took the path never travelled when he became the Faculty of Engineering's first PhD student. It wasn't the last time Ritter made a bold move.

Bluefish Studios

PhD Pioneer

Robert Ritter earned the first PhD in the Faculty of Engineering

by Ryan Smith

It was 1954, and twenty-two year-old graduate Robert Ritter (MSc Chemical '54) wondered what to do next. He knew his decision would have a huge impact on the rest of his life.

"There was far less info available in the 1950s about career possibilities," Ritter recalls. "There was no Internet—there weren't even any computers. The only way to get the lowdown on something was to go out and do it.

"I could have gone into industry, but the prospects back then didn't appeal to me. I didn't want to work in a quality control lab; that seemed too cookie-cutter and routine. That just wasn't me."

As often happens in the life stories of successful people, Ritter decided to follow his passion. He loved conducting research, so he chose to pursue a PhD. He wrote letters to the deans of a number of engineering programs across the country—including the Faculty of Engineering at the University of Alberta, which, unbeknownst to Ritter, had never granted a PhD before.

A few schools accepted him, but Ritter struck a connection with the U of A's dean at the time, Dr. George Govier.

In 1962, Ritter earned the first engineering PhD in U of A history, launching a journey that kept him involved for nearly a half century in some of the most interesting engineering projects in Western Canada and beyond.

The colleagues Ritter met along the way sometimes found him intimidating, at least initially. "My first contact with him was as his student in my second year, and at first I was terrified of him," smiles Dr. Alan Mather, a U of A Faculty of Engineering professor emeritus.

"He always had a kind of mean and angry look, but when I got to know him better I found out he was actually a very gentle and helpful person."

Perhaps Ritter's gruff exterior was the result of being born into harsh conditions—Saskatchewan during the Great Depression.

But he worked hard, and when he arrived in Edmonton in the mid-1950s he began a successful career doing what engineers do best: solving problems.

Under Govier's supervision, Ritter published his PhD thesis, a seminal work on the pipeline characteristics of crude oil. He stayed on as a faculty member at the U of A until 1966, when he left to become the first chair of the Chemical Engineering program at the brand-new University of Calgary. He eventually became U of C's Dean of Engineering.

But before he left the U of A, Ritter had a hand in developing (among other things) the world's first pipeline viscometer, which a graduate student created under his supervision. The device measures the viscosity of a liquid as it flows in a pipeline.

"Before [the viscometer], you needed to take a sample from the line and then take it back to the lab to measure it—and, if you realized then that you needed to change the flow, it was already too late," Mather explains.

Today, the instrument has been computerized, sending instant measurements to labs to

Bluefish Studios

Robert Ritter (at right) displays the oxygen separator he invented. The portable device provided 95 percent pure oxygen for emphysema and cystic fibrosis patients, allowing them to regain their mobility.

Ritter created a medical device that improved and lengthened the lives of many patients—and changed the course of his own life forever.

maintain the correct pressure and energy for an optimal flow.

For his next notable feat, Ritter created a medical device that improved and lengthened the lives of many patients—and changed the course of his own life forever. In concert with the head of cardiology at the Foothills Hospital in Calgary, Ritter developed a method of extracting oxygen from the atmosphere, and he left his post as dean of the U of C Faculty of Engineering in 1974 to manufacture his invention.

"It helped people with emphysema and cystic fibrosis and those kinds of nasty things that make it hard to breathe," Ritter says.

The stationary appliance, which Ritter called the Reox machine, sucked in air and rejected nitrogen, leaving patients with 95 percent pure oxygen."It was a piece of furniture—it looked like a TV set. It had a long tube and a cannula attached to it so you could move around your house. The main benefit was that it removed the constant worry you would run out of oxygen, as you would with oxygen bottles, which were the only other options available at the time and were fire hazards."

"There were people whose lives were completely altered," he adds. "I remember one farmer just gave up. He came to the hospital and didn't want to see his kids anymore, didn't want to do anything. But we got him back to the farm, got him on the machine, and when we went out to visit him he was out on a grass mower mowing his lawn with the long tube in his nose and a big smile on his face. He loved it."

Ritter built about 100 of the machines, and his business "really blossomed".

Sadly, it didn't last. "They worked well, but the main problem was that they were built with household parts—vacuum parts—that weren't intended for continuous use, and they needed maintenance, which I had to do myself. It became overwhelming, especially because people began to depend on them totally."

"I was new to the industrial world and didn't appreciate how much capital it takes to bring that sort of system into general use," he adds.

After two years, in 1976, the business collapsed, and Ritter decided to move into contract work. One of his first jobs was to tackle Alberta's primary environmental challenge: devising a method to clean up an oil sands tailings pond.

"Technically, I was able to get crap out of the pond, but the cost of doing it was too much. Even if the process was free, the cost of handling the material would be uneconomical. When we realized that, there was no sense continuing with it," he says.

Ritter then took a series of jobs for a company called Western Research, a subsidiary of Bow Valley Industries. For example, he developed a technique to dispose of the PCBs that were used in obsolete transformers.

"Transformers are those cylinders that are about a metre and a half high and a metre in diameter behind your house," Ritter explains. "They drop the voltage from 4,000 volts to 110, so you can get the electricity in your house. They used to be filled with an oil that contained PCBs, which are a wonderful insulator. The problem is, PCBs contain chlorine, which makes them an environmental hazard, and they had to get rid of them.

"There were hundreds and hundreds of [the obsolete transformers], and I developed a furnace for getting rid of the PCBs in the way that allowed you to salvage and sell the metal."

Ritter's next big contract provided a history lesson as well as an environmental challenge.

The Canadian military hired Ritter to develop a safe way to destroy "a few tons" of lewisite that it had been storing for decades at a base near Suffield in southern Alberta. "Lewisite is a war chemical, like mustard gas but about 100 times more toxic," says Ritter. "It's a vesicant that attacks the eyes and skin and destroys everything it touches."

Think that sounds bad? It gets worse. "It's a liquid made up of about 35 percent arsenic, and one little drop the size of a pinhead

Ritter designed a full-scale unit built at the hazardous waste disposal site in Swan Hills, Alberta. The unit (above) was used in the decontamination of PCB-laden transformers. Below, Ritter is seen with a pilot model of a process that was used to destroy tons of war chemicals at Canadian Forces Base Suffield, in southern Alberta.

would be enough to kill everyone in the room—very nasty stuff."

The Canadian army had procured the chemical from the U.S. Army. The Americans had developed and refined it throughout the 20th century as a response to mustard gas, which the Germans had used in World War I. Fortunately, the chemical was never used except in tests on animals. Unfortunately, it was hard to destroy.

"Mustard gas was not easy to destroy, but it was easier to destroy than lewisite because you could burn the mustard and then get rid of the sulphur dioxide, and they had a technology for that," says Ritter. "But I had to develop a process of several steps to get rid of the lewisite. It was a chemical process, and in the end it worked pretty well."

It worked so well that about ten years later, when the Americans wanted to get rid of their own remaining lewisite, they licensed the process from Ritter and called on him for help. "I went down there and they had it in a system that required a lot of upgrading, and when they realized how much the process would cost they weren't prepared to put up money to do it, so they abandoned it," he says.

"What they've done with the lewisite only the gods know. My guess is they dumped it in the ocean—that's the conventional thinking."

In the early 1990s, Ritter moved to British Columbia and starting doing contract work for Australian National Industries to clean up contaminated soil. He built a prototype and called it the Lymelox Process.

"We could take soil contaminated with PCB, dioxins or any nasty carcinogenic and reduce them down to parts per billion and have no exhaust, not even carbon dioxide, so nothing, nothing came off in this process," Ritter says.

"The secret of the process was the preconditioning of the lime. You would run the soil through an auger and then combine it with another augered feed of lime. "The real advantage of it is that it ran at a much lower temperature than other incineration processes and consequently didn't have nasty material forming on you, like dioxins.

"If you ran contaminated soil through the process, what would come out on the back was just original soil and lime carbonate—the lime absorbed the carbon dioxide."

However, the "misadventures of Australian National Industries in Europe" forced them to sell the subsidiary, Consolidated Environment Technology, to a large Australian steel company, which wasn't interested in developing the Lymelox process any further.

"The process still hasn't been matched by any other technology, and if the company had survived it might have taken off," Ritter believes. "I tried to keep it going, but I figured it would have taken about $40–50 million to pull the first piece of it together, and you need to be a young man to keep something like that going.

"It's just very difficult to raise cash for something like what I was trying to do. People pretend to be interested in venture capital, but that's a myth. They want something that's already proven, and that they know they can get an immediate return on investment from it.

"Big companies will support researchers through grants funding and write it off if it doesn't work, but, as an individual, if you want to be an inventor you need to invent Velcro or a safety pin or something like that. Something that everyone understands and you can build a prototype for and get market evaluated. Then you might be able to do it."

Ritter worked on the Lymelox project until 1999, and he considers it his last big venture. It never succeeded financially, but he neither regrets it nor is he bitter about the way it ended. "I don't apologize for not being able to raise 50 million. It would be nice to sit back now and point to a giant company and say I started it, but I can't say that, and that's okay.

"When I look back on all the things I worked on—the PCB furnaces, the Reox machine, the lewisite, the Lymelox—they worked. The things that we set out to do, we were able to do, and that's where the satisfaction comes from."

In particular, Ritter feels good about the Reox machines, because they made a direct improvement in the lives of "a couple of dozen people."

"Of all the things I've done in my professional life, that was the most satisfying."

Now in his mid-70s, the U of A's first engineering PhD graduate lives just outside of Vancouver, in "a big house with some property around it," which he spends most of his time repairing and renovating.

In spite of the struggles and setbacks in his chosen career, Ritter feels blessed. He raised four kids, consulted for more than 30 companies around the world, served as chair of the Calgary Region Arts Foundation (among other associations), and produced more than a dozen patents.

"I've always had an interest in science—even as a little kid—and when I was 22 and not sure what to do with my life, I thought about my love for doing research, and then it became clear to me what I should do, and I was right," he said.

"If I had to do it all over again I'd do the exact same thing."

Gustav Stroem Christensen

1929–2007

Gustav Stroem "Gus" Christensen was born April 1, 1929 on a farm on the tiny Danish island of Laesoe. The eighth of nine children, Gustav completed nine years of schooling in an ancient one-room elementary school and the island's brand-new junior high school.

In 1945, he ventured to Copenhagen to take a radio operator apprenticeship. He served as a radio operator with the Danish Merchant Navy for four years, and on an American oil tanker for another two. His travels took him to ports on five continents and to Canada, where he visited his brother and sister who had immigrated to the prairies.

When Christensen joined his siblings in Canada, his life abruptly changed. He completed his entire high school diploma in six months, mainly through correspondence school in Edmonton, and enrolled in Engineering Physics at the University of Alberta.

He blossomed as an engineering student, taking the Henry Birks Gold Medal in 1958, along with several other scholarships. After a summer with the National Research Council in Ottawa, he took his M.A. Sc. in Electrical Engineering under Dr. Frank Noakes at the University of British Columbia in 1960.


Gustav Stroem Christensen

Christensen worked with the BC Energy Board and Chemcell in Edmonton, but disliked the odours associated with chemical engineering. So he beat a hasty retreat to the rarified atmosphere of academia at UBC. His PhD thesis (1966), under supervisor Dr. Avrom Soudack, examined the stability of non-linear mathematical models of systems.

In July 1966, even before he had defended his thesis, Christensen was lured back to the U of A as assistant professor. He spent the next 27 years teaching, researching and taking a large load of administrative responsibilities for the Department of Electrical Engineering. He taught 16 different courses, but his forte was the one-on-one training with his 24 graduate students.

Christensen's research focused on the optimum economic operation of various types of power systems, minimizing the energy lost in transmission lines while generating the maximum possible amount of power. He authored over 140 scientific papers, four books and four chapters in books on his research specialties.

In 1969 Christensen married an English immigrant, Penelope Janet Gardner, in Edmonton. They have two children, Lynne and Neil.

Christensen retired as full professor to Mission, BC in 1993. He and Penny joined the Church of Jesus Christ of Latter-Day Saints and both served at the church's Family History Centre in Abbotsford. With Penny, a professional genealogist, Gus wrote his autobiography, the history of his parents' 172 descendants, and a volume of translations of historical articles on Laesoe, the island of his birth.

Christensen was an intervener in the National Energy Board hearings that resulted in the rejection of the huge SE2 coal-fired plant, a project that would have emitted unacceptable pollution into the Fraser Valley funnel. Onlookers will always remember the NEB Chairman saying, "So, Dr. Christensen, is that your entire argument?" Gus replied, "No sir, I am just getting started." It brought the house down.

At 75, Christensen took up an adjunct professorship in the School of Engineering Science at Simon Fraser University, where he had an office, a computer and a grad student – but no salary. He spent one or two days there each week until he died, and he published what he considered to be his best work during this time. These papers and patents were in the field of asymptotic stability of linear and nonlinear systems, a continuation of his PhD work. He simplified the solutions to Lyapunov's widely applicable stability theorems, making them useful to electric power engineers, other practical engineers, and many other professionals. With the help of linear programming, he also solved the least absolute value estimation problem originally posed by Laplace in 1750.

Gus Christensen died August 9, 2007 at the age of 78. He enjoyed many trips with his family, and was justly proud of their success. He was a wonderful man, touched many lives and is sadly missed.

in memoriam

The Faculty of Engineering sincerely regrets the passing of the following alumni and friends.

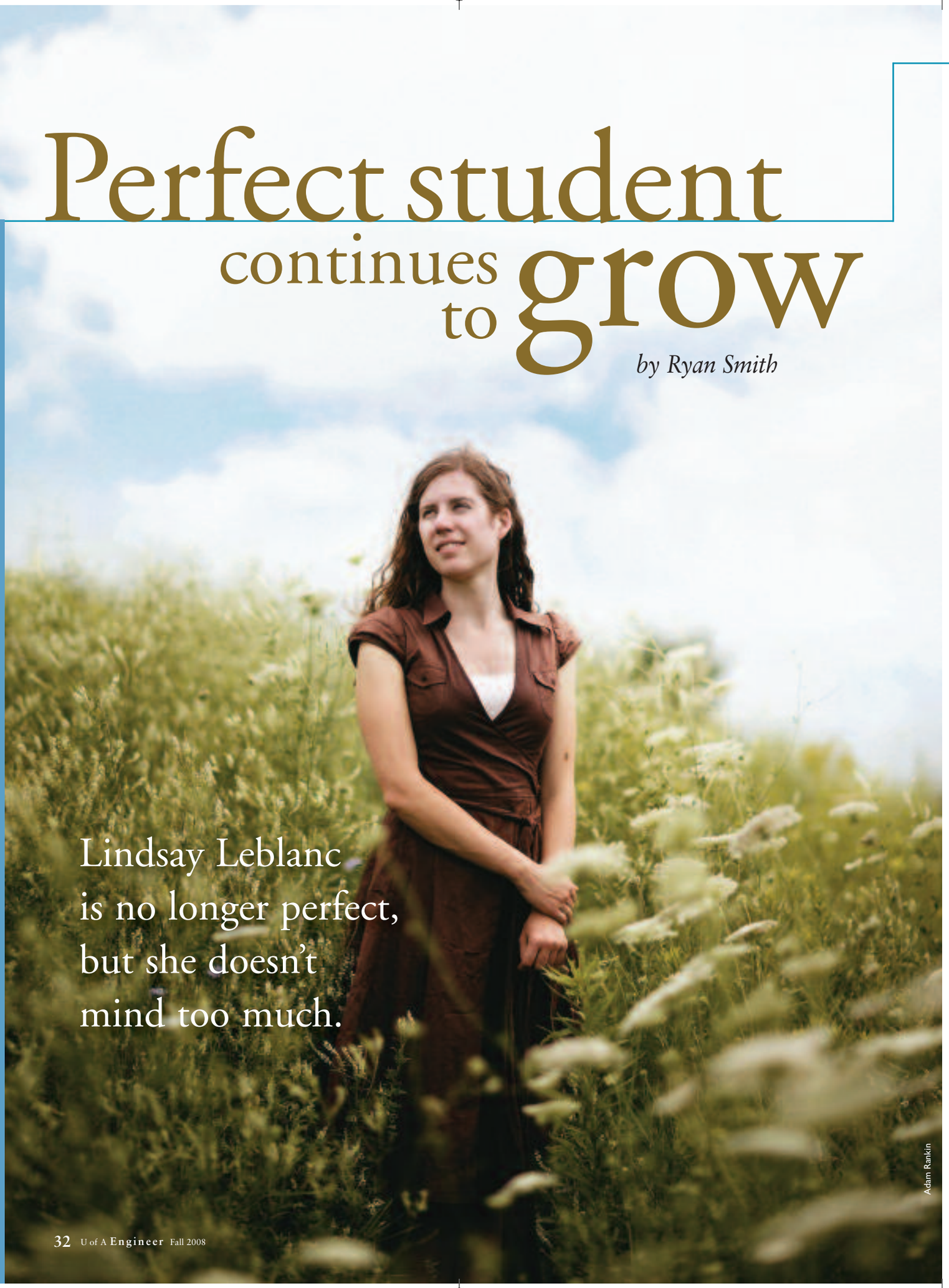
Anderson, Wendy (Mineral Process '81)
Bradley, Horace (Electrical '50)
Dawson, Earl (Electrical '50)
Fedoruk, Raymond (Electrical '69)
Good, Max (Mining '40)
Hawkins, William (Electrical '49)
Lien, Clifford (Electrical '52)
Matheson, J Donald (Civil '51)
Poland, Charles (Petroleum '56)
Ragan, John (Civil '74)
Reynolds, John (Mining '42)
Smerek, Alexander (Civil '50)
Tod, James (Petroleum '55)
Van Der Lee, Arie (Civil '47)
Warne, George (Electrical '51)
Williams, Reagan (Mechanical '92)
Willumsen, Arnold (Civil '58)

The Faculty of Engineering was recently made aware of the following alumni who passed away more than a year ago.

McIntosh, Alexander M. (Petroleum '51)
Spence, Robert (Civil '48)
Wong, James (Civil '75, MEng Civil '77)

Perfect student continues to grow

by Ryan Smith



Lindsay Leblanc is no longer perfect, but she doesn't mind too much.

Adam Rankin

Leblanc (Engineering Physics '03) earned a perfect grade in all 46 of her undergraduate classes. On graduating, she added the 2003 Governor General's Award and C.D. Howe Fellowship.

Leblanc was part of the last U of A class to be marked on the nine-point grade scale (the U of A switched to the more traditional four-point scale in the fall of 2003), and she received a nine in every class she took. "I think it was easier to maintain a perfect record in the nine-point scale than it would have been according to the letter scale," she says modestly.

Now a PhD student in physics at the University of Toronto, Leblanc admits her academic record is no longer completely unblemished. "I received an A-minus in one of my master's classes a few years ago," she laughs. "It was actually a really tough class, and I didn't have some of the background I needed going into it, but that's OK. I learned a lot."

Not surprisingly, Leblanc continues to do well for herself nearly five years after her flawless run at the U of A. Now 26 years old, she received her master's in physics at the U of T in 2005, and hopes to attain a PhD in physics by 2010.

Despite her stellar success as an undergraduate, Leblanc admits she had some misgivings about entering graduate school,

"I took a year off after the U of A and considered becoming a high school teacher," she says. "I love kids and I love teaching, and it was the classic idea that I wanted to do something good for the world, and I wasn't sure grad school was the way to do that. But then I came to the decision that I love to learn, so I choose grad school. I still plan to teach, but now it'll be at the university level."

Shortly after writing her final exam for her engineering physics degree in the U of A's Department of Computer and Electrical Engineering, Leblanc threw some clothes and a Eurail pass into a backpack and hopped on a plane to wander Western Europe for three months.

Her favorite stop was Rome. "I grew up on the Prairies and there aren't too many things there that are more than 100 years old, so when you can go to a place like Rome, with so much history, it's really interesting."

When she returned to Canada, Leblanc engaged in some much needed relaxation. "I slept in and loafed a bit," she smiles. "I really needed some time off at that point." She also indulged her love of reading—particularly Canadian literature—and became addicted to CBC Radio One.

Not one to remain idle for long, Leblanc eventually did volunteer work and got a job part-time with the Women in Scholarship, Engineering, Science and Technology (WISEST) program, an organization close to her heart. "As a female in math and science, you're always told that you can be as good as the guys, and I've always worked to try to prove it," she says.

Leblanc continues to achieve in graduate school. "Lindsay is the senior graduate student on an ultra-cold atom experiment to study the physics of ferromagnetism," says her PhD supervisor, Dr. Joseph Thywissen. "She is rapidly becoming an independent researcher. Recently she gave her first invited talk—at Simon Fraser University—and she has also published a first-author paper this year in Physical Review A."

Thywissen goes on to describe Leblanc's current research. "One of the main goals of our field is to understand how high-temperature superconductivity works. There are various models proposed for what this does, but they can't be solved by computers, so we hope the kind of experiments our lab is working on will help us understand this type of physics better."

Leblanc works in a room full of lasers that also includes a vacuum system and magnetic fields, which control the models of atoms that she and her colleagues build in order to better understand their properties.

The research is basic, says Leblanc, but the knowledge gained may be applied in many ways. "For one example, this material's resistance to electricity is so low—zero—that if we were able to understand it and use it to transmit electricity, it would be much more efficient than current methods, which lose about half the power." The materials could also be used to build powerful magnets, she adds. These might, for example, improve the efficiency of the levitating bullet trains in Japan.

"Lindsay is an extremely dedicated worker," marvels Thywissen. "She sometimes runs the experiment late into the night—a time when scientific breakthroughs canonically occur."

Leblanc largely enjoys those long hours, but confesses that sometimes it gets monotonous. "Working in a lab is almost like doing manual labour," she observes. "Sometimes I feel like I need to sit down and learn something, so I find myself opening textbooks just to do that.

"I also read a lot of novels," she adds. "I decided that, when I became a grad student, I was going to continue to read, even if it takes away from my studies, because I love reading, and that's what makes me happy."

Her life in Toronto includes more than lab work and reading. "I have a lot of friends now," she says. "It took a while after moving here, but I definitely have an active social life these days. And I really enjoy living in Toronto. I love the diversity. I can sit in a circle of friends and realize that I'm the only one who's a native English speaker, and that's pretty neat.

"I think I'm a big city kid in the end," she adds. "I grew up in the suburbs of prairie cities and, you know, they're always the same—there's always a Wal-Mart and a Superstore. Now I live in a neighborhood where there's not a single chain business; everything's independently owned, and there's a coffee shop on the corner and a used book store and a used clothing store, and I can ride my bike anywhere I want to go. I love that."

Not surprisngly, Leblanc continues to well for herself nearly five years after her flawless run at the U of A.

After Leblanc earns her PhD, she plans to do a post-doctoral fellowship and then find a job as a faculty member at a Canadian university, perhaps the U of A.

"I really enjoyed my time at the U of A. I think it's a great school and I have a lot of good friends there," she says. "And I know this is going to sound lame, but I really miss the administration at the U of A—it's a lot better organized and friendlier than at the U of T."

The university isn't the only thing that might draw Leblanc back to Alberta. "I miss the Prairies sometimes. I miss being able to see the sky."

That's ironic, because the sky is her only limit.

Continuing a tradition of GIVING

By Richard Cairney

You don't have to look very far to see the many ways that Engineering alumni have given back to the community. Whether volunteering to help build a neighbourhood playground, coaching a sports team or making significant financial donations, engineering alumni have a long tradition of community service.

"Every gift counts; everything is meaningful," says Nena Jocic-Andrejevic, the Faculty of Engineering's Planned Giving Counsel. In her role as a fund development professional, Jocic-Andreovic helps families find alternate ways of supporting the community through gift planning.

Many people think they aren't able to support causes they're passionate about, and Jocic-Andrejevic says they're often surprised to learn that they are capable of giving more than they'd imagined.

"Often, we feel that our finances restrict our ability to give back to the community on a regular basis. Maybe it's because we're young and just starting out in our life and our profession, or because we're starting a family, or caring for our own parents—we have obligations."

But that doesn't mean that, at the end of the day, we can't make a gift from our accumulated assets. Jocic-Andrejevic is straightforward on this point: "It is a truism that the only things certain in life are death and taxes," she says.

While there's nothing we can do about death, there are plenty of options for dealing with taxes—and that, says Jocic-Andrejevic, is where people become pleasantly surprised in their ability to support institutions and causes.

"Most of us support our passions by volunteering or giving back to an institution that provided us with an education, the foundation of the careers that enabled us to raise our families. Through planned giving, you give not through your income, but through your assets."

"When you look at your estate, there are going to be taxes on it. Most people are miffed when they discover how much tax there will be on it. But the government allows us the opportunity to make choices, if we wish, to invest some of those assets into our passions to a degree we weren't able to solely do through our income—and receive a significant tax deduction."

Jocic-Andrejevic says that with planned giving, we are all empowered to give, emphasizing the importance of having a "plan" in planned gifts. "My role is to listen to people and work with their financial planners to assist them in developing a plan that takes care of themselves and their family, but also to look at the amount of taxes on their estate and making an informed choice about how they want to manage their taxable assets—their social capital."

Many people think they aren't able to support causes they're passionate about, and Jocic-Andrejevic says they're often surprised to learn that they are capable of giving more than they'd imagined.

U of A Engineer will have regular features on planned giving. For more information on planned giving contact Nena Jocic-Andrejevic, the Faculty of Engineering's Planned Giving Counsel, at 789-492-8969 or via e-mail at nena.jocic andrejevic@ualberta.ca.

Bluefish Studios

Nena Jocic-Andrejevic

FILIPCHUK, DAVID
(Civil '84) PEng

Has been appointed as regional vice president, Western Canadian buildings operations for PCL. Filipchuk began his PCL career in 1984 as a field engineer in Edmonton, and has served the organization at numerous locations across North America. In 2004, he became operations manager for PCL Edmonton, prior to his appointment as district manager of Southern Alberta operations in the same year. Filipchuk was appointed vice president and district manager of Southern Alberta operations in 2005.

GROVER, DR. WAYNE D.
(PhD Electrical '89), PEng

Has been elected as a Fellow in the Royal Society of Canada: The Academies of Arts, Humanities and Sciences of Canada. Founded in 1882, RSC is Canada's most prestigious scholarly organization. Election to RSC is the highest honour a scholar can achieve in the Arts, Humanities and Sciences. A professor for the Department of Electrical and Computer Engineering, Grover was also awarded 2008 Alberta Ingenuity Fund Research Excellence Award.

HEINZ, HEINRICH K.
(MSc Civil '84, Ph.D. Civil '88) PEng

Has been appointed Managing Director of Thurber Engineering Ltd. Heinz joined Thurber's Calgary office in 1995 and was appointed as a Principal in 2000. He served as Thurber's Calgary office manager from 1999 until 2007, during which time, the office developed in both size and staff expertise and capabilities, to become one of the leading geotechnical consulting firms in the City. He has worked on major geotechnical engineering projects in Canada and abroad, and is well known for his contributions in the fields of tunneling and trenchless technology. In his new capacity, he will continue to be involved with senior review of projects in the oil and gas, municipal and transportation infrastructure sectors. Heinz will be based in Calgary.

HILL, DAVID W.
(MSc Civil '77), PEng

Has been appointed President and Chairman of the Board of Thurber Engineering Ltd. Hill joined the firm's Edmonton office in 1983 and subsequently relocated to the Vancouver office in 1995. He has previously served as Branch Manager for Thurber's Edmonton and Vancouver offices and most recently as the firm's Managing Director. Hill's expertise encompasses foundation investigation and design for buildings, land development projects, and transportation and municipal infrastructure. He has practiced in Alberta and British Columbia, and is currently based in Thurber's Vancouver office.

McGINLEY, MARK
(Civil '83, MSc Civil '85, PhD Civil '88)

A professor and endowed chair of infrastructure research and civil engineering at the University of Louisville in Kentucky, McGinley recently received an ASTM International Award of Merit. He was recognized for his outstanding dedication to and involvement in the entire masonry industry, and particularly the standards process, including research contributions related to test methods.

MORGAN, GWYN
(Mechanical '67) , PEng

Has been appointed to Canada's Outstanding CEO of the Year Advisory Board for 2008 by the Caldwell Partners, Deloitte, CTV and the National Post. Morgan is retired founding president CEO of EnCana Corporation and was named the 2005 recipient of Canada's Outstanding CEO of the Year Award.

SARMA, HEMANTA
(PhD Petroleum '88)

Professor Hemanta Sarma is a recipient of the 2008 Australian Learning & Teaching Council Citation for Outstanding Contributions to Student Learning "for initiating students into the profession of Petroleum Engineering while interacting with them to secure their welfare as individuals and success as scholars". Sarma holds the Reg Sprigg Chair in Petroleum Engineering at the Australian School of Petroleum Engineering, University of Adelaide.

SOROCHAN, ERNEST
(Chemical '72), PEng

Has been appointed to the board of directors for Mainland Resources Inc. Sorochan has built a professional career focusing on understanding all technical aspects of planning, drilling, evaluating and completing high-pressure sour gas fields as well as operations of gas plant facilities. Most recently, Sorochan joined Compton Petroleum Corporation (2004-2008) of Calgary to provide engineering support for areas in southern Alberta, conduct economic evaluations and capital expenditures, coordinate completions, and help recommend new wells and select new exploration areas.

TAYLOR, DON '58 BSc
(Civil '58, MSc Civil '60), PEng

Has been named a laureate of the Calgary Business Hall of Fame. He was honoured for his entrepreneurial spirit and for his work as president of Engineered Air, an air-conditioning equipment manufacturing business. Under his direction, this company achieved steady growth and never experienced an unprofitable quarter.

USENIK, ANDREW
(Civil '08) E.I.T.

As the lead vocalist and songwriter for the Edmonton-based punk rock group Ten Second Epic, Usenik has been touring the country and working on a new album, after crossing the convocation stage this summer. He has also taken on a position as a songwriter with Sony Music, as well as writing and performing with his own band.

Corrections

On page 35 of the Winter/Spring 2008 issue of U of A Engineer, the class organizer for the Class of 1968 Chemical Engineering was incorrectly identified as Bruce Burdenie. Our apologies to Bill Burdenie who was in fact the class organizer.

On page 23 of the Winter/Spring 2008 edition of U of A Engineer, Dr. Jeff DiBattista (MSc Structural '95, PhD Structural '00) PEng was named as the sole recipient of the Consulting Engineers of Alberta award of merit in building engineering, for the PCL Centennial Learning Centre. In fact, the award was presented to an entire team from Cohos Evamy "for their excellent work on the mechanical, electrical, and structural engineering systems," says DiBattista. "The success of the PCL building was a team effort—many of whom are graduates of the University of Alberta—and it is their work that truly deserves the recognition."

Do you have news to share?

Send news of your awards, appointments, and other successes to engineer.alum@ualberta.ca

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University of Alberta ENGINEERING

Celebrating a Century

This year, as we celebrate 100 years of engineering education at the University of Alberta, the 20,000th U of A Engineer will graduate. More than ever, a new generation of engineering graduates will be inspired by the accomplishments of those alumni who have graduated before them. But while the campus, the tools, and the technology may have changed, today's engineers share a common goal with their predecessors: to use human creativity and imagination, along with an understanding of natural phenomena, to solve the problems of society.

Today, the Faculty of Engineering at the U of A is recognized as one of the top engineering programs in North America, and the foundation of our success has been the outstanding tradition of our alumni supporting each new generation of engineers. We thank you for your continued commitment to our faculty.

If you have any comments regarding the Faculty of Engineering or would like more information on how you can support future U of A Engineers, please contact:

Laurie Shinkaruk, Acting Assistant Dean, External Relations
Faculty of Engineering, University of Alberta
c/o E6-050 Engineering Teaching and Learning Complex
Edmonton, AB T6G 2V4
Tel: 403.718.6394
E-mail: laurie.shinkaruk@ualberta.ca

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Your donation to the U of A	$100	$500	$1,000	$2,500
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* To best meet Faculty of Engineering's needs, donations may be directed to endowed funds. Donations made to endowment funds are invested in perpetuity and the investment earnings are used to advance the specified purposes of the fund within the University.

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☐ I would like information on how to make a gift of publicly traded securities to support the Faculty of Engineering at the U of A.

☐ I would like information on how to include the Faculty of Engineering at the U of A as part of a will, life insurance, or other planned gift instrument.

☐ I have provided for the Faculty of Engineering at the U of A in a will or trust agreement.

Please return to:
Office of the Dean, Faculty of Engineering
University of Alberta
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